
**CONSTRUCTION SPECIFICATIONS
LANDFILL 2 (FTC-006)
FORT CARSON, COLORADO**

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Omaha District

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SPECIFICATIONS OF CONSTRUCTION LANDFILL 2 - CAP CONSTRUCTION

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SECTION 01050

CONSTRUCTION STAKING

PART 1 GENERAL

1.1 SUMMARY

1.1.1 SUBCONTRACTOR Responsibilities

- a. Vertical and horizontal control shall be established by the SUBCONTRACTOR in the form of bench marks prior to starting earth work at the project site. All construction staking shall be the responsibility of the SUBCONTRACTOR. In addition, the SUBCONTRACTOR shall be responsible to review all construction staking with CONTRACTOR'S CQA representative to identify the features staked.
- b. SUBCONTRACTOR will perform survey for certification. This work shall include:
 1. Survey excavation and fill (top of final cap subgrade) surfaces prior to placing final cap barrier layer.
 2. Survey top of final cap barrier layer to ensure the minimum thickness of material has been placed.
 3. Survey top of frost protection layer to ensure the minimum thickness of material has been placed.

SUBCONTRACTOR shall provide the survey information to the CONTRACTOR and assist with clarification of survey items as requested by the CONTRACTOR to aid in interpretation of survey data to assist CONTRACTOR in preparation of Record Drawings for the certification report.

- c. Survey work shall be performed by a Professional Land Surveyor registered in the State of Colorado.

1.1.2 Primary Control Monuments

Bench marks shall be established by the SUBCONTRACTOR to establish primary vertical and horizontal control for Work.

1.2 SUBMITTALS

The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

SD-01 DATA\.

1. Computations for control stations and bench marks.
2. Field notes.
3. Survey data.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 BENCH MARKS

Fifteen permanent horizontal/vertical control monuments shall be established at Landfill 2. Each monument shall be assigned 3rd order State Plane coordinates and Mean Sea Level elevations. Horizontal and vertical control must be independently verified. The control monuments shall be established outside of the area of proposed construction on stable ground and the points shall be intervisible. Bench mark locations shall be approved the CONTRACTOR. A first-

order geodetic monument is present at the Post. Variations in the number of permanent control monuments shall be approved by the CONTRACTOR.

3.1.1 Bench Mark Construction

Each control monument shall be constructed by advancing a 6-inch diameter borehole to a depth of 4 feet and driving a 1-inch diameter by 8-foot long steel rod through the bottom of the borehole to a total depth of approximately 7.5 feet. A 5-foot long, thick-walled, 4-inch diameter steel casing shall then be set to the bottom of the borehole and the annular space inside and around the casing shall be filled with concrete. Monuments shall be constructed to protrude approximately 6 inches above the surrounding ground surface. Each monument shall be completed with a standard 4-inch diameter bronze survey disc set into the masonry. Monuments shall be stamped.

Descriptions showing at least three ties to all monuments set in the field and approximate directions and measured distances shown on a drawing shall be provided. If field features are not available for ties, then witness posts shall be set. The SUBCONTRACTOR shall compute one combination factor, or factors, as a minimum requirement. The respective combination factor, or factors, shall be noted for each area.

3.1.2 Accuracy

The project control survey shall meet or exceed the horizontal and vertical accuracy criteria as defined by the Standards and Accuracy and General Specifications of Geodetic Control Surveys established by the U.S. Department of Commerce. Horizontal control positions shall be within Third Order, Class I accuracy and accomplished by those standards. The closing error of control leveling for the survey/monuments shall not exceed 0.05 foot times the square root of M, where M is the miles of leveling. Computations for all control stations and bench marks shall be furnished to the CONTRACTOR for submittal to the Government.

3.2 CONSTRUCTION LINE AND GRADE

SUBCONTRACTOR shall bear sole responsibility for correct transfer of construction lines and grades from bench marks for the correct alignment and grade of completed Work based on lines and grades shown on Drawings. SUBCONTRACTOR shall establish vertical and horizontal reference control stakes in the proximity of the work as follows:

3.2.1 Datum for Control

Horizontal coordinates shall be based on Modified State Plane Coordinates, Colorado Control Zone, based on NAD 83 (adjustment factor 1.00026853). Elevations shall be based on Mean Sea Level NAV 88.

3.2.2 Excavation and fill to reach final cap subgrade:

- a. Elevations shall be taken on existing ground on 100 foot grid and breaks per the Drawings prior to construction, to be used as reference data for verification of record quantities.
- b. Rough cut/fill stakes on a 100 foot grid shall be set for the final cap subgrade when the SUBCONTRACTOR starts construction or when the SUBCONTRACTOR is close to grade. Alternately, SUBCONTRACTOR may use laser guided equipment.
- c. Cut/fill stakes shall be set on a 100 foot grid for finished grading of the final cap subgrade. Alternately, SUBCONTRACTOR may use laser guided equipment.
- d. Certification surveying shall be on a 100 foot grid, along breaks, and along significant structures per the Drawings (such as top or toe of slopes, edge of cap, ditches, roads, etc.).

3.2.3 Final Cap Barrier Layer

Cut/fill stakes will be set on a 100 foot grid when the final cap barrier layer is near finish grade. Alternately, SUBCONTRACTOR may use laser guided equipment. Certification surveying shall be performed on a 100 foot grid, along breaks, and along significant structures per the Drawings (such as top or toe of slopes, edge of cap, ditches, roads, etc.).

3.2.4 Frost Protective Layer

Certification surveying shall be performed on a 100 foot grid, along breaks, and along significant structures per the Drawings (such as top or toe of slopes, edge of cap, ditches, roads, etc.).

3.2.5 Data Transfer

SUBCONTRACTOR shall provide a copy of field notes in a neat and legible format to CONTRACTOR at the end of the day upon which the survey is performed. In addition, at least once per each week survey work is performed, a copy of the survey data shall be submitted on a high density, 1.44 MB, 3.5" diskette, in a standard ASCII file format. Coordinates should be input as decimal numbers in columns for point ID, northing, easting and elevation. All columns shall be separated by blanks, tabs, or commas.

3.3 SURVEY MONUMENTS

The SUBCONTRACTOR shall protect survey monuments marked by CONTRACTOR existing throughout Project area. If monuments are damaged, The SUBCONTRACTOR shall advise CONTRACTOR immediately. SUBCONTRACTOR shall replace damaged monuments by a Registered Land Surveyor at SUBCONTRACTOR'S expense.



SECTION 01190

PROGRESS MEETINGS

PART 1 GENERAL

1.1 SUMMARY

This section covers the required progress meetings which will be held at the project site.

1.2 GENERAL REQUIREMENTS

The SUBCONTRACTOR shall administer the following general requirements:

- a. Prepare agenda for meetings
- b. Make physical arrangements for meetings
- c. Preside at meetings
- d. Record the minutes; include significant proceedings and decisions
- e. Reproduce and distribute copies of minutes within three days after each meeting to meeting participants and to parties affected by decisions made at the meeting. Furnish three copies of the minutes to the CONTRACTOR.

1.3 ATTENDANCE

Suggested attendance for the progress meetings includes but is not limited to the following:

- a. CONTRACTOR
- b. SUBCONTRACTOR'S Superintendent
- c. SUBCONTRACTOR'S Quality Control Supervisor
- d. SUBCONTRACTOR'S Industrial Hygiene Technician
- e. SUBCONTRACTORS as appropriate to the agenda
- f. Suppliers as appropriate to the agenda
- g. Others as appropriate

1.4 SUGGESTED AGENDA

The suggested agenda items for the progress meetings include but are not limited to the following:

- a. Review and approval of minutes of previous meeting
- b. Review of progress since previous meeting
- c. Field observations, problems, conflicts
- d. Problems which impede construction schedule and proposed corrective actions
- e. Review of off-site delivery schedules
- f. Corrective measures and procedures to regain projected schedule
- g. Revisions to construction schedule
- h. Projected progress during succeeding work period
- i. Coordination of schedules
- j. Review submittal schedules; expedite as required
- k. Maintenance of quality and safety standards
- l. Changes and substitutions
- m. Review proposed changes for effect on construction schedule and on completion date, and effect on other contracts of the project
- n. Other business as appropriate

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 MINIMUM REQUIREMENTS

The SUBCONTRACTOR shall schedule and administer at least two progress meetings per month and such additional meetings as required by the CONTRACTOR and as necessary to meet project needs. These meetings shall be held at the project site.



SECTION 01200

WARRANTY OF CONSTRUCTION

PART 1 WARRANTY OF CONSTRUCTION (Apr 1984)

1.1 Foremost and in addition to any other warranties in this contract, the SUBCONTRACTOR warrants, except as provided in paragraph 1.10 of this clause, that work performed under this contract conforms to the contract requirements and is free of any defect in equipment, material, design furnished, or workmanship performed by the SUBCONTRACTOR or any SUBCONTRACTOR or supplier at any tier.

1.2 WARRANTY DURATION

1.2.1 The warranty for the Fort Carson Landfill 2 Cap Construction shall extend for 1 year from the date of acceptance by the Government.

1.2.2 The warranty for site reconstruction work shall continue for a period of 1 year from the date of final acceptance of the work. If the Government takes possession of any part of the work before final acceptance, this warranty shall commence for that part on the date of possession and continue for a period of 1 year.

1.3 The SUBCONTRACTOR shall remedy at the SUBCONTRACTOR'S expense any failure to conform, or any defect. In addition, the SUBCONTRACTOR shall remedy, at the SUBCONTRACTOR'S expense, any damage to Government-owned or controlled real or personal property, when that damage is the result of-

- a. The SUBCONTRACTOR'S failure to conform to contract requirements; or
- b. Any defect of equipment, material, workmanship, or design furnished by the SUBCONTRACTOR.

1.4 The SUBCONTRACTOR shall restore any work damaged in fulfilling the terms and conditions of this clause.

1.5 The SUBCONTRACTOR'S warranty with respect to work restored, repaired or replaced will run for 1 year from the date of restoration, repair or replacement. This provision applies equally to all items restored, repaired, or replaced under paragraph 1.3 and 1.4 above.

1.6 The CONTRACTOR will notify the SUBCONTRACTOR, in writing, within a reasonable time after the discovery of any failure, defect, or damage. Repair work necessary to correct a warranty condition which arises to threaten the health or safety of personnel, the physical safety of property or equipment, or which impairs operations, habitability of living spaces, etc., will be performed by the SUBCONTRACTOR on an immediate basis as directed verbally by the CONTRACTOR. Written verification will follow verbal instruction.

1.7 Failure of the SUBCONTRACTOR to respond as verbally directed will be cause for the CONTRACTOR to have the warranty repair work performed by others and to proceed against the SUBCONTRACTOR as outlined in the paragraph 2.1.1. If the SUBCONTRACTOR fails to remedy any failure, defect, or damage within a reasonable time after receipt of notice, the CONTRACTOR shall have the right to replace, repair, or otherwise remedy the failure, defect, or damage at the SUBCONTRACTOR'S expense, as outlined in paragraph 2.1.1.

1.8 With respect to all warranties, express or implied, from SUBCONTRACTORS, manufacturers, or suppliers for work performed and materials furnished under this contract, the SUBCONTRACTOR shall-

- a. Obtain all warranties that would be given in normal commercial practice;
- b. Require all warranties to be executed, in writing, for the benefit of the Government.

1.9 Unless a defect is caused by the negligence of the SUBCONTRACTOR or supplier/SUBCONTRACTOR at any tier, the SUBCONTRACTOR shall not be liable for the repair of any defects of material or design furnished by the CONTRACTOR nor for the repair of any damage that results from any defect in CONTRACTOR-furnished material or design.

1.10 This warranty shall not limit the CONTRACTOR'S right under the contract with respect to latent defect, gross mistakes, or fraud.

PART 2 ADDITIONAL WARRANTY REQUIREMENTS

2.1 PERFORMANCE

2.1.1 If either the SUBCONTRACTOR or his representative doesn't diligently pursue warranty work to completion, the SUBCONTRACTOR and his surety will be liable for all costs. The CONTRACTOR, at its option, will either have the work performed by others or require the surety to have it done. Both direct and administrative costs will be reimbursable to the CONTRACTOR.

2.2 PRE-WARRANTY CONFERENCE

2.2.1 Prior to contract completion and at a time designated by the CONTRACTOR, the SUBCONTRACTOR shall meet with the CONTRACTOR to develop a mutual understanding with respect to the requirements of the Paragraph: WARRANTY OF CONSTRUCTION. Communication procedures for SUBCONTRACTOR notification of warranty defects, priorities with respect to the type of defect and other details deemed necessary by the CONTRACTOR for the execution of the construction warranty shall be established/reviewed at this meeting.

2.2.2 In connection with these requirements and at the time of the SUBCONTRACTOR'S quality control completion inspection, the SUBCONTRACTOR will furnish the name, telephone number and address of the *service representative* which is authorized to initiate and pursue warranty work action on behalf of the SUBCONTRACTOR and surety. This single point of contact will be located within the local service area of the warranted construction, will be continuously available, and will be responsive to CONTRACTOR inquiry on warranty work action and status. This requirement does not relieve the SUBCONTRACTOR of any Contractual responsibilities in connection with the paragraph: WARRANTY OF CONSTRUCTION.

2.2.3 Local service area is defined as the area in which the SUBCONTRACTOR or his representative can meet the response times as described in paragraph 2.3 and in any event shall not exceed 200 miles radius of the construction site.

2.3 WARRANTY SERVICE CALLS

The SUBCONTRACTOR will respond to the site within twenty-four (24) hours of a call from the site.

PART 3 SUBMITTALS

The following shall be submitted in accordance with Section 01300:

SD-01 Data\

Service Representative\

Names of service representatives that will make warranty calls along with the day, night, weekend and holiday contacts for response to a call within the time period specified.



SECTION 01300

SUBMITTAL DESCRIPTIONS

PART 1 GENERAL

1.1 SUBMITTALS

The submittals described below are those required and further described in other sections of the specifications. Other requirements pertaining to submittals are included in the SPECIAL CLAUSES and Section 01305 SUBMITTAL PROCEDURES. Submittals required by the CONTRACT CLAUSES and other nontechnical parts of the contract are not included in this section.

SD-01 Data\

Submittals which provide calculations, descriptions, or documentation regarding the work.

SD-04 Drawings\

Submittals which graphically show relationship of various components of the work, schematic diagrams of systems, details of fabrication, layouts of particular elements, connections, and other relational aspects of the work.

SD-06 Instructions\

Preprinted material describing installation of a product, system or material, including special notices and material safety data sheets, if any, concerning impedances, hazards, and safety precautions.

SD-07 Schedules\

Tabular lists showing location, features, or other pertinent information regarding products, materials, equipment, or components to be used in the work.

SD-08 Statements\

A document, required of the Vendor, or through the Vendor, from a supplier, installer, manufacturer, or other lower tier Vendor, the purpose of which is to confirm the quality or orderly progression of a portion of the work by documenting procedures, acceptability of methods or personnel, qualifications, or other verifications of quality.

SD-09 Reports\

Reports of inspections or tests, including analysis and interpretation of test results. Each report shall be properly identified. Test methods used shall be identified and test results shall be recorded.

SD-13 Certificates\

Statement signed by an official authorized to certify on behalf of the manufacturer of a product, system or material, attesting that the product, system or material meets specified requirements. The statement must be dated after the award of this contract, must state the Vendor's name and address, must name the project and location, and must list the specific requirements which are being certified.

SD-14 Samples\

Samples, including both fabricated and unfabricated physical examples of materials, products, and units of work as complete units or as portions of units of work.

SD-18 Records\

Documentation to record compliance with technical or administrative requirements.

SD-19 Operation and Maintenance Manuals\

Data which forms a part of an operation and maintenance manual.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

SECTION 01305

SUBMITTAL PROCEDURES

ATTACHMENTS: Submittal Register (ENG Form 4288)
 Transmittal Form (ENG Form 4025)

PART 1 GENERAL

1.1 SUMMARY (Not Applicable)

1.2 REFERENCES (Not Applicable)

1.3 RESPONSIBILITIES

1.3.1 SUBCONTRACTOR and CONTRACTOR Responsibilities

The SUBCONTRACTOR is responsible for management of his work including scheduling, control, and submittals. The submittal management system provided in these specifications is intended to be a complete system for the CONTRACTOR and SUBCONTRACTOR to use to control the quality of materials, equipment and workmanship provided by manufacturers, fabricators, suppliers and SUBCONTRACTORS. The CONTRACTOR and SUBCONTRACTOR shall review each submittal for contract compliance. Submittals that do not conform will be returned to the originator to be corrected. The Submittal Register (ENG Form 4288) will be utilized to log and monitor all submittal activities. No construction or installation activities shall be performed prior to required approvals of applicable submittals. The SUBCONTRACTOR shall perform a check to ensure that all materials and/or equipment have been tested, submitted and approved during the preparatory phase of quality control inspections.

1.3.2 CONTRACTOR Responsibilities

The CONTRACTOR will prepare a list of submittals required for each contract. This list will be prepared on ENG Form 4288 (Submittal Register) and will be limited to columns "c" through "o". The CONTRACTOR will review submittals for approval and approve those that conform to contract requirements. The approval of submittals by the CONTRACTOR shall not be construed as a complete check, but will indicate only that the general method of construction, materials, detailing and other information are satisfactory. Approval will not relieve the SUBCONTRACTOR of the responsibility for any error which may exist, as the SUBCONTRACTOR under the CQC requirements of this contract is responsible for the dimensions and design of adequate connections, details and satisfactory construction of all work. After submittals have been approved, no resubmittal for the purpose of substituting materials or equipment will be given consideration unless accompanied by justification as to why a substitution is necessary.

1.4 SUBMITTAL CLASSIFICATION (Not Used)

1.5 CATEGORIES OF SUBMITTALS (Not Used)

1.6 DISAPPROVED SUBMITTALS

The SUBCONTRACTOR shall make all corrections required by the CONTRACTOR and promptly furnish a corrected submittal in the form and number of copies as specified for the initial submittal. The SUBCONTRACTOR shall examine his quality control plan and organization to determine why his controls did not identify the deficiency. Appropriate adjustments will be made in the quality control program and/or implementation. If the SUBCONTRACTOR considers any correction indicated on the submittals to constitute a change to the contract, notice as required under the Contract Clause entitled "Changes" shall be given promptly to the CONTRACTOR.

1.7 WITHHOLDING OF PAYMENT

Payment for materials incorporated in the work will not be made if required submittals/approvals have not been obtained.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 GENERAL

The SUBCONTRACTOR shall submit all items listed on the Submittal Register (ENG Form 4288) or specified in the other sections of these specifications. The CONTRACTOR may request submittals in addition to those listed when deemed necessary to adequately describe the work covered in the respective sections. Units of weights and measures used on all submittals shall be the same used in the contract drawings. Submittals shall be made in the respective number of copies and to the respective addresses set forth below. Each submittal shall be complete and in sufficient detail to allow ready determination of compliance with all contract requirements. Prior to submittal, all items shall be checked and approved by the SUBCONTRACTOR'S Quality Control (CQC) representative and each respective transmittal form (ENG Form 4025) shall be stamped, signed, and dated by the CQC representative certifying that the accompanying submittal complies with all the contract requirements. Proposed deviations from the contract requirements shall be clearly identified. Submittals shall include items such as: SUBCONTRACTOR'S, manufacturer's, or fabricator's drawings; descriptive literature including (but not limited to) catalog cuts, diagrams, operating charts or curves; test reports; test cylinders; samples; O&M manuals including parts list; certifications; warranties and other such required submittals. Submittals requiring approval shall be scheduled and made prior to the acquisition of the material or equipment covered thereby.

3.2 SUBMITTAL REGISTER (ENG Form 4288)

The SUBCONTRACTOR will be furnished one (1) set of ENG Forms 4288 at the preconstruction conference on which will be listed each item of equipment and material of each type for which fabricators drawings, and/or related descriptive data, test reports, samples, spare parts lists, O&M manuals, or other types of submittals are required by the specifications. Columns "c" thru "o" will be completed by the CONTRACTOR. The SUBCONTRACTOR shall complete columns "a," and "q" thru "s" and return three (3) completed copies to the CONTRACTOR for approval within twenty (20) calendar days after the preconstruction conference. Column b shall be left blank for use later to record the respective transmittal and item number corresponding to those listed on the transmittal form entitled: "TRANSMITTAL OF SHOP DRAWINGS, EQUIPMENT DATA, MATERIAL SAMPLES, OR MANUFACTURER'S CERTIFICATES OF COMPLIANCE" (ENG Form 4025). The approved submittal register will become the scheduling document and will be used to control submittals throughout the life of the contract. This register and the progress schedules shall be coordinated.

3.3 SCHEDULING

Submittals covering component items forming a system or items that are interrelated shall be scheduled to be coordinated and submitted concurrently. Certifications to be submitted with the pertinent drawings shall be so scheduled. Adequate time (a minimum of twenty (20) calendar days exclusive of mailing time) shall be allowed on the register for review and approval. No delays, damages, or time extensions will be allowed for time lost in late submittals.

3.4 TRANSMITTAL FORM (ENG Form 4025)

The sample transmittal form (ENG Form 4025) attached to this section shall be used for submitting submittals in accordance with the instructions on the reverse side of the form. These forms will be furnished to the SUBCONTRACTOR. This form shall be properly completed by filling out all the heading blank spaces and identifying each

item submitted. Special care will be exercised to ensure proper listing of the specification paragraph and/or sheet number of the contract drawings pertinent to the data submitted for each item.

3.5 SUBMITTAL PROCEDURE

All items listed on the Submittal Register shall be mailed directly to the CONTRACTOR. The mailing address shall be obtained from the CONTRACTOR at the preconstruction conference.

Each required submittal which is in the form of a drawing shall be submitted as one (1) reproducible and one (1) print of the drawing. Drawing prints shall be either blue or black line permanent-type prints on a white background or blueprint. Reproducibles shall be brownline diazo or sepia and shall be of such quality that prints made therefrom are sufficiently clear for microfilm copying.

All catalog and descriptive data shall be submitted in three (3) copies. Catalog cuts and other descriptive data which have more than one model, size, or type or which shows optional equipment shall be clearly marked to show the model, size, or type and all optional equipment which is proposed for approval. Submittals on component items forming a system or that are interrelated shall be submitted at one time as a single submittal in order to demonstrate that the items have been properly coordinated and will function as a unit.

3.5.1 Certificates of Compliance

Each certificate shall be signed by an official authorized to certify in behalf of the manufacturing company and shall contain the name and address of the SUBCONTRACTOR, the project name and location, and the quantity and date or dates of shipment or delivery to which the certificates apply. Copies of laboratory test reports submitted with certificates shall contain the name and address of the testing laboratory and the date or dates of the tests to which the report applies. Certification shall not be construed as relieving the SUBCONTRACTOR from furnishing satisfactory material, if, after tests are performed on selected samples, the material is found not to meet the specific requirements.

3.5.2 Deviations

For submittals which include proposed deviations requested by the SUBCONTRACTOR, the column "variation" of ENG Form 4025 shall be checked. The SUBCONTRACTOR shall set forth in writing the reason for any deviations and annotate such deviations on the submittal. The CONTRACTOR reserves the right to rescind inadvertent approval of submittals containing unnoted deviations.

3.6 CONTROL OF SUBMITTALS

The SUBCONTRACTOR shall carefully control his procurement operations to ensure that each individual submittal is made on or before the SUBCONTRACTOR scheduled submittal date shown on the approved "Submittal Register."

3.7 CONTRACTOR APPROVED SUBMITTALS

Upon completion of review of submittals, the submittals will be identified as having received approval by being so stamped and dated.

The drawing print and three (3) sets of all catalog data and descriptive literature will be retained by the CONTRACTOR. Copies of the submittals for approval, drawings, catalog data and descriptive literature will be returned to the SUBCONTRACTOR.

3.8 STAMPS

Stamps used by the CONTRACTOR on the submittal data to certify that the submittal meets contract requirements shall be similar to the following:

CONTRACTOR

(Firm Name)

_____ Approved

_____ Approved with corrections as noted on submittal data and/or attached sheets(s).

Signature: _____

Title: ____

Date: ____

3.9 DISPOSAL OF SUBMITTAL SAMPLES

When submittal samples are no longer required for review or testing, the SUBCONTRACTOR shall, upon notification from the CONTRACTOR, pick up and dispose of the samples in accordance with manufacturers' Material Safety Data Sheets (MSDS), all applicable Federal, State, and local regulations, and in a manner approved by the CONTRACTOR.

**INSTRUCTIONS
ENG FORM 4288**

1. Column a, will be provided by the SUBCONTRACTOR from his Network Analysis, if required, and when a network analysis is accepted.
2. Column b, will be provided by the SUBCONTRACTOR from Eng Form 4025 for each item. Transmittal number and Item number will be the same on both forms.
3. Column c, will be provided by the CONTRACTOR to the SUBCONTRACTOR.
4. Column d thru n, will be provided by the CONTRACTOR to the SUBCONTRACTOR.
5. Column o, will not be used
6. Column p, will be not be used.
7. Column q, will be provided by the SUBCONTRACTOR. It will be the scheduled date the SUBCONTRACTOR expects to submit an item. It is the SUBCONTRACTOR'S responsibility to calculate the lead time needed for the CONTRACTOR'S approval. Note if resubmittal is required, it is the SUBCONTRACTOR'S responsibility to make all adjustments necessary to meet the contract completion date.
8. Column r, will be provided by the SUBCONTRACTOR. It will be the latest date the SUBCONTRACTOR can receive an approval and still obtain the material by need date.
9. Column s, will be provided by the SUBCONTRACTOR. It will be the date that the material is needed at the site. If there is a network analysis it should reflect that date on the analysis.
10. Column t, will be provided by the SUBCONTRACTOR. The code will contain the action code used on Eng Form 4025, column g, for each item submitted to the CONTRACTOR.
11. Column u, will be provided by the SUBCONTRACTOR. The date will be the same as shown at the top of corresponding Eng Form 4025 and will reflect the date the actions shown in column t were rendered.
12. Column v, will be not be used.
13. Column w, will be provided by the CONTRACTOR. The code will contain the action code used on Eng Form 4025 column i, for each item submitted to the CONTRACTOR.
14. Column x, will be provided by the CONTRACTOR. The date when the actions listed in column w were taken will be entered. The date will be the same as shown in Eng Form 4025, Section II.
15. Column y, self explained.

Any revisions to the submittal register shall be submitted for approval by the SUBCONTRACTOR as soon as possible.

**INSTRUCTIONS
ENG FORM 4025**

1. DATE at the top of form will be the date submitted to the CONTRACTOR which is to be completed by the SUBCONTRACTOR.
2. TRANSMITTAL NO. Each new transmittal shall be numbered consecutively in the space provided for "Transmittal No.". This number, in addition to the item number, will form the submittal number for identifying each submittal. For new submittal or resubmittal, mark the appropriate box. Transmittal number for resubmittal will contain an alphabet letter following original transmittal number (e.g. resubmittal of Transmittal Number 5 will be Transmittal Number 5a).
3. TO: box will contain the name and address of the office which will review the submittal. The name and address should be given in paragraph 3.5.
4. FROM: box will be the name and address of the SUBCONTRACTOR. SUBCONTRACTOR is to complete this box.
5. CONTRACT NO. box will contain the SUBCONTRACTORS construction contract number.
6. CHECK ONE box will be completed by the SUBCONTRACTOR with one box marked. If a resubmittal is provided last transmittal number will be added.
7. SPECIFICATION SECTION NO. box will be completed by the SUBCONTRACTOR. The number will be the five digit number found in the specifications. No more than one section will be covered with each transmittal.
8. PROJECT TITLE AND LOCATION box will be completed by the SUBCONTRACTOR.
9. Column a, will be completed by the SUBCONTRACTOR and will contain a different number for each item submitted in that transmittal. Once a number is assigned to an item it will remain the same even if there is a resubmittal.
10. Column b, will be completed by the SUBCONTRACTOR. The description of each item on this form will include the descriptions provided by the CONTRACTOR on the submittal register Eng Form 4288 column d thru n plus any other data necessary to describe the item. The SUBCONTRACTOR shall submit each submittal register item all at once on one transmittal if possible. If a submittal register item can not be submitted all at once, SUBCONTRACTOR should note that in the remarks box. If a submittal register item requires several items, description shall contain submittal register description plus any additional specific descriptions. Additional items not on the submittal register will be noted in the remarks box.
11. Column c, will be completed by the SUBCONTRACTOR. The information will be the appropriate submittal description number as described in Section 01300 or shown on submittal register Eng Form 4288 column d thru n.
12. Column d, will be completed by the SUBCONTRACTOR. The number of copies will be determined by the SUBCONTRACTOR after review of paragraph 3.5 of Section 01305 "Submittal Procedures".
13. Column e, will be completed by the SUBCONTRACTOR. The SUBCONTRACTOR shall state all applicable paragraph numbers.

14. Column f, will be completed by the SUBCONTRACTOR. The SUBCONTRACTOR shall state all applicable drawing sheet numbers.
15. Column g, will be completed by the SUBCONTRACTOR. The action codes will be one of the following when submittal is for the CONTRACTOR:
 - A - Approved as submitted.
 - B - Approved, except as noted.
 - C - Approved, except as noted. Refer to attached sheet resubmission required.
 - G - Other (specify).
16. Column h, will be completed by the SUBCONTRACTOR. A check shall be placed in this column when a submittal is not in accordance with the plans and specifications, and a written statement to that effect shall be included in the space provided for "Remarks".
17. Column i, will be completed by the CONTRACTOR. The action code will be one of the following;
 - A - Approved as submitted.
 - B - Approved except as noted on drawings.
 - C - Approved except as noted on drawings. Refer to the attached resubmission sheet as required.
 - D - Will be returned by separate correspondence.
 - E - Disapproved (See Attached).
 - Fx - Receipt acknowledged, does not comply as noted with contract requirements.
 - G - Other (specify).
18. REMARKS box self explained.
19. SUBCONTRACTOR must sign all Eng Form 4025 certifying conformance.
20. Section II will be completed by the CONTRACTOR. SUBCONTRACTOR is not to write in this space.

See reverse side of ENG Form 4025 for additional instructions.

SECTION 01320

CONSTRUCTION PHOTOGRAPHS

PART 1 GENERAL

1.1 SUMMARY

This section covers the required construction photographs to be taken at the site.

1.2 GENERAL REQUIREMENTS

SUBCONTRACTOR shall take construction record photographs periodically during the course of work.

1.3 SUBMITTALS

1.3.1 Prework Photographs

Take views of general site showing location and arrangement of facilities, equipment, fencing, and access roads.

1.3.2 Progress Photographs

After work has started at site, photographically record progress of Work. Include coverage of following:

- a. Site preparation.
- b. Site clearing.
- c. Excavation and fill activities.
- d. Closure of any monitoring wells.
- e. Barrier layer placement.
- f. Frost protection layer placement.
- g. Seeding.
- h. Construction of facilities.
- i. Decontamination of equipment.
- j. Cleanup and restoration

Photographs shall illustrate conditions and location of work and state of progress. Photograph from locations to adequately illustrate condition of construction:

- a. At each location to adequately illustrate condition of construction.
- b. At successive periods of photography, take at least one photograph from the same overall view as previous.

Actual number and location of views to be taken for progress photographs shall be as directed by CONTRACTOR or his representative.

1.3.3 Post-Work Photographs

After completion of work, CONTRACTOR shall take sufficient views of general site to record post-work condition using wide angle lens.

1.3.4 Negatives

Negatives shall remain property of CONTRACTOR.

1.4 QUALITY ASSURANCE

1.4.1 Use 35 mm single reflex camera with wide angle lens and ASA 400 Color Film for slides (slide negatives can be used for generating prints)

PART 2 PRODUCTS

2.1 PRINTS

2.1.1 Color

2.1.1.1 Paper

Commercial quality, single weight, white base

2.1.1.2 Finish

Smooth surface, glossy

2.1.1.3 Size

- a. Prework, Post Work: 3-1/2-in. by 5-in.
- b. Progress: 3-1/2-in. by 5-in.

2.1.2 Identification

2.1.2.1 Each print shall show, by photographic means, information box, 1 in. by 2 in. taped to bottom of photograph.

2.1.2.2 Box shall be typewritten and arranged as follows.

Project No.: _____ Contract No.: _____

Contractor: _____

Photograph No.: _____ Date: _____

Description: _____

PART 3 EXECUTION

3.1 TECHNIQUE

3.1.1 Factual presentation

3.1.2 Correct exposure and focus

3.1.2.1 High resolution and sharpness

3.1.2.2 Maximum depth-of-field

3.1.2.3 Minimum distortion

3.1.3 Undeveloped film shall be stored as to prevent film damage.

3.2 DELIVERY OF PRINTS AND NEGATIVES

3.2.1 Deliver 2 prints of each photograph, with negatives, within 10 calendar days after taking photographs. Photographs and negatives shall be CONTRACTOR property and not released by SUBCONTRACTOR to anyone except CONTRACTOR or his representative. Photographs shall be enclosed back-to-back in double-faced plastic sleeve punched to fit standard 3-ring binder.

SECTION 01401

SAFETY, HEALTH AND EMERGENCY RESPONSE

PART 1 GENERAL

1.1 SUMMARY

Safety, health and emergency response shall be as detailed in the below-referenced plan. All work performed under the project shall comply with all applicable federal, state and local safety and occupational health rules and regulations.

1.2 REFERENCES (Not Applicable)

1.3 GENERAL REQUIREMENTS

Safety, health and emergency response shall be as detailed in the **A**ite-Specific Health and Safety Plan, **@**Appendix A of the **A**raft Landfills 2, 5, and 6 Cap Installation Work Plan **@**

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

Safety, health and emergency response actions shall be as detailed in the **A**ite-Specific Health and Safety Plan, **@**Appendix A of the **A**raft Landfills 2, 5, and 6 Cap Installation Work Plan **@**

SECTION 01405

TEMPORARY FIRE PROTECTION

PART 1 GENERAL

1.1 This section covers SUBCONTRACTOR'S responsibilities for the prevention and control of fire at the project site during the contract period.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Fire Extinguishers

Fire extinguishers shall consist of 20-pound type ABC fire extinguishers.

PART 3 EXECUTION

3.1 TRAINING OF SUBCONTRACTOR PERSONNEL

All SUBCONTRACTOR personnel who may be involved in fire fighting activities shall have received fire fighting training in accordance with OSHA 20 CFR 1910.156. Training shall include dealing with smoke in air supply masks and malfunctions in other protective equipment.

3.2 FIRE FIGHTING EQUIPMENT REQUIREMENTS

3.2.1 Site Trailers

A minimum of one fire extinguisher in each site trailer.

3.3 OUTSIDE ASSISTANCE

The SUBCONTRACTOR shall prearrange for the services of the Fort Carson Fire Department and coordinate roles of the local fire department and SUBCONTRACTOR personnel.

SECTION 01430

ENVIRONMENTAL PROTECTION

PART 1 GENERAL

1.1 SUMMARY

Environmental protection shall be as described in the plans referenced below.

1.2 REFERENCES (Not applicable)

1.3 GENERAL REQUIREMENTS

Environmental protection requirements shall be as detailed in the "Task Specific Environmental Protection Plan", Appendix B of the "Landfills 2, 5, and 6 Cap Construction Work Plan".

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 GENERAL

Environmental protection actions shall be as detailed in the "Task Specific Environmental Protection Plan", Appendix B of the "Landfills 2, 5, and 6 Cap Construction Work Plan".

SECTION 01440

CONTRACTOR QUALITY CONTROL

PART 1 GENERAL

1.1 SUMMARY

Quality control shall be as described in the plans referenced below.

1.2 REFERENCES (Not applicable)

1.3 GENERAL REQUIREMENTS

Quality Control requirements shall be as detailed in the "Draft Construction Quality Assurance Plan", Appendix E of the "Landfills 2, 5, and 6 Cap Construction Work Plan".

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 GENERAL

Quality control actions shall be as detailed in the "Draft Construction Quality Assurance Plan", Appendix E of the "Landfills 2, 5, and 6 Cap Construction Work Plan".

SECTION 01500

TEMPORARY CONSTRUCTION FACILITIES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

1.1.1 Site Plan

The SUBCONTRACTOR shall prepare a site plan in accordance with the Drawings indicating the proposed location and dimensions of any area to be fenced and used by the SUBCONTRACTOR, the number of trailers to be used, avenues of ingress/egress to the fenced area and details of the fence installation. Any areas which may have to be graveled to prevent the tracking of mud shall also be identified. The SUBCONTRACTOR shall also indicate if the use of a supplemental or other staging area is desired.

1.1.2 Employee Parking

CONTRACTOR and SUBCONTRACTOR employees shall park privately owned vehicles in the area designated on the Drawings. CONTRACTOR employee parking shall not interfere with existing and established parking requirements of the military installation.

1.2 AVAILABILITY AND USE OF UTILITY SERVICES

1.2.1 Payment for Utility Services

The Government will make all reasonably required utilities available to the CONTRACTOR and SUBCONTRACTOR from existing outlets and supplies. The CONTRACTOR and SUBCONTRACTOR shall carefully conserve any utilities furnished without charge. The SUBCONTRACTOR shall be responsible for any charges associated with non-government utilities if required.

1.2.2 Meters and Temporary Connections

The SUBCONTRACTOR, in a manner satisfactory to the Contracting Officer or his representative, shall provide and maintain necessary temporary connections, and distribution lines.

1.2.3 Sanitation

The SUBCONTRACTOR shall provide and maintain within the construction area minimum field-type sanitary facilities in addition to sanitary facilities at the administration area approved by the Contracting Officer or his representative. Government toilet facilities will not be available to CONTRACTOR and SUBCONTRACTOR personnel.

1.2.4 Telephone

The CONTRACTOR and SUBCONTRACTOR shall make arrangements and pay all costs for telephone facilities desired.

1.3 BULLETIN BOARD, PROJECT SIGN, AND PROJECT SAFETY SIGN

1.3.1 Bulletin Board

Immediately upon beginning of work, the SUBCONTRACTOR shall provide a weatherproof glass-covered bulletin board not less than 915 by 1220 mm (36 by 48 inches) in size for displaying the Equal Employment Opportunity poster, a

copy of the wage decision contained in the contract, Wage Rate Information poster, and other information approved by the CONTRACTOR. The bulletin board shall be located at the project site in a conspicuous place easily accessible to all employees, as approved by the Contracting Officer or his representative. Legible copies of the aforementioned data shall be displayed until work is completed. Upon completion of work the bulletin board shall be removed by and remain the property of the SUBCONTRACTOR.

1.3.2 Immediately upon beginning of work, the SUBCONTRACTOR shall provide a project safety sign in accordance with the sign specifications and details at the end of this Section.

1.4 PROTECTION AND MAINTENANCE OF TRAFFIC

During construction, the SUBCONTRACTOR shall provide access and temporary relocated roads as necessary to maintain traffic. The SUBCONTRACTOR shall maintain and protect traffic on all affected roads during the construction period except as otherwise specifically directed by the Contracting Officer or his representative. Measures for the protection and diversion of traffic, including the provision of watchmen and flagmen, erection of barricades, placing of lights around and in front of equipment and the work, and the erection and maintenance of adequate warning, danger, and direction signs, shall be as required by the State and local authorities having jurisdiction. The traveling public shall be protected from damage to person and property. The SUBCONTRACTOR'S traffic on roads selected for hauling material to and from the site shall interfere as little as possible with normal traffic. The SUBCONTRACTOR shall investigate the adequacy of existing roads and the allowable load limit on these roads. The SUBCONTRACTOR shall be responsible for the repair of any damage to roads caused by construction operations.

1.4.1 Haul Roads

The SUBCONTRACTOR shall construct access and haul roads necessary for proper prosecution of the work under this contract. Haul roads shall be constructed with suitable grades and widths; sharp curves, blind corners, and dangerous cross traffic shall be avoided. The SUBCONTRACTOR shall provide necessary lighting, signs, barricades, and distinctive markings for the safe movement of traffic. The method of dust control, although optional, shall be adequate to ensure safe operation at all times. Location, grade, width, and alignment of construction and hauling roads shall be subject to approval by the CONTRACTOR. Lighting shall be adequate to assure full and clear visibility for full width of haul road and work areas during any night work operations. Upon completion of the work, haul roads designated by the CONTRACTOR shall be removed.

1.4.2 Barricades

The SUBCONTRACTOR shall erect and maintain temporary barricades to limit public access to hazardous areas. Such barricades shall be required as necessary to limit access of both pedestrian and vehicular traffic. Barricades shall be securely placed, clearly visible with adequate illumination to provide sufficient visual warning of the hazard during both day and night.

1.5 CONTRACTOR/SUBCONTRACTOR'S TEMPORARY FACILITIES

1.5.1 Administrative Field Offices

The CONTRACTOR shall provide and maintain administrative field office facilities within the CONTRACTOR'S storage yard.

1.5.2 Storage Area

The SUBCONTRACTOR shall construct a temporary 4 foot high international orange polyethylene safety fence around trailers and materials at Landfill 2. Fence posts may be driven, in lieu of concrete bases, where soil conditions permit. Trailers, materials, or equipment shall not be placed or stored outside the fenced area or outside the fenced area at the administrative field office unless such trailers, materials, or equipment are assigned a separate and distinct storage area by the CONTRACTOR away from the vicinity of the construction site but within the military boundaries. The

CONTRACTOR will provide a portion of the storage area at the administrative field office for the SUBCONTRACTOR'S use. Trailers, equipment, or materials shall not be open to public view with the exception of those items which are in support of ongoing work on any given day. Materials shall not be stockpiled outside the fence in preparation for the next day's work. At the end of each work day mobile equipment, such as wheeled lifting equipment, cranes, trucks, and like equipment, shall be parked within the fenced area.

1.5.3 Supplemental Storage Area

Upon SUBCONTRACTOR'S request, the CONTRACTOR will designate another or supplemental area for the SUBCONTRACTOR'S use and storage of trailers, equipment, and materials. This area may not be in close proximity of the construction site but shall be within the military boundaries. Fencing of materials or equipment will not be required at this site; however, the CONTRACTOR shall be responsible for cleanliness and orderliness of the area used and for the security of any material or equipment stored in this area. Utilities will not be provided to this area by the Government.

1.5.4 Appearance of Trailers

Trailers utilized by the CONTRACTOR and SUBCONTRACTOR for administrative or material storage purposes shall present a clean and neat exterior appearance and shall be in a state of good repair. Trailers which, in the opinion of the Contracting Officer or his representative, require exterior painting or maintenance will not be allowed on the military property.

1.5.5 Maintenance of Storage Area

Fencing shall be kept in a state of good repair and proper alignment. Should the SUBCONTRACTOR elect to traverse with construction equipment or other vehicles grassed or unpaved areas which are not established roadways, such areas shall be covered with a layer of gravel as necessary to prevent rutting and the tracking of mud onto paved or established roadways; gravel gradation shall be at the SUBCONTRACTOR'S discretion.

1.5.6 Security Provisions

The SUBCONTRACTOR shall be responsible for the security of its own equipment.

1.6 CLEANUP

Construction debris, waste materials, packaging material and the like shall be removed from the work site daily. Any dirt or mud which is tracked onto paved or surfaced roadways shall be cleaned away. Roadway cleaning and dust control methods are discussed within the ~~A~~Site Specific Environmental Protection Plan~~@~~Appendix B of the ~~A~~Draft Landfills 2, 5, and 6 Cap Installation Work Plan~~@~~Materials resulting from demolition activities which are salvageable shall be stored within the fenced area described above or at the supplemental storage area. Stored material not in trailers, whether new or salvaged, shall be neatly stacked when stored.

1.7 RESTORATION OF STORAGE AREA

Upon completion of the project and after removal of trailers, materials, and equipment from within the fenced area, the fence shall be removed and disposed of at an appropriate off-site facility. Areas used by the SUBCONTRACTOR for the storage of equipment or material, or other use, shall be restored to the original or better condition.

SECTION 01702

CONTRACT CLOSEOUT

PART 1 GENERAL

1.1 SUMMARY

This section covers the activities necessary to close out the contract.

1.2 GENERAL REQUIREMENTS

1.2.1 Work Activities

Work activities for contract closeout shall include the following:

- a. Decontamination and removal from site of all SUBCONTRACTOR equipment and materials within the Exclusion Zone.
- b. Collection and disposal of all SUBCONTRACTOR-generated contaminated materials and equipment for which decontamination is inappropriate.
- c. Decontamination of site-dedicated equipment and facilities operated by the CONTRACTOR and removal from site of same.
- d. Disconnection and removal of temporary utilities from site.
- e. Removal of support area facilities.
- f. Repair of permanent site security fences damaged during the performance of the work.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 DECONTAMINATION

All facilities, equipment, and materials that may have been in contact with potentially contaminated materials shall be decontaminated in accordance with the procedures described in SECTION 01900: MATERIAL AND EQUIPMENT DECONTAMINATION prior to final removal.

3.2 RETENTION ON SITE

In general, all small tools and materials for which decontamination is difficult or uncertain shall remain on site until completion of the work for subsequent disposal. Examples of such equipment or materials include wire, rope, lumber, personnel protection equipment and apparel in accordance with the Waste Management Plan submitted as Appendix C of the Draft - Landfills 2, 5, and 6 Cap Installation Project Work Plan, dated November 1995 (or latest revised version).

3.3 UTILITIES

Temporary telephone lines, water lines, electric service lines, utility poles, and outdoor lighting fixtures required during the construction period shall be disconnected at the source and removed from the site.

3.4 OPERATIONS AREA

All equipment and facilities used for closure activities shall be thoroughly decontaminated prior to site closeout. Sediments and liquid shall be removed from sumps and disposed in accordance with the Waste Management Plan referenced in Paragraph 3.2.

3.5 WASH UNITS

Wash units in the personnel decontamination area shall be the final equipment removed from the site.

SECTION 01720

PROJECT RECORD DOCUMENTS

PART 1 GENERAL

1.1 SUMMARY

Maintain at site one record copy of:

1. Drawings.
2. Project Manual.
3. Addenda.
4. Change orders and other modifications to Contract.
5. CONTRACTOR field orders, written instructions, or clarifications.
6. Approved submittals.
7. Field test records.
8. Construction photographs.
9. Associated permits.
10. Certificates of inspection and approvals.

1.2 SUBMITTALS

1.2.1 General

At Substantial Completion:

/*SD-04 DRAWINGS*/

Deliver one marked up set of Drawings and Specifications to CONTRACTOR for use in preparation of record Drawings.

1.2.2 Transmittal Letters

Accompany submittals with transmittal letter containing following:

- a. Date.
- b. Project title and number.
- c. SUBCONTRACTOR'S name and address.
- d. Title of record document.
- e. Signature of SUBCONTRACTOR or authorized representative.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 MAINTENANCE OF DOCUMENTS AND SAMPLES

3.1.1 General

Maintain documents in clean, dry, legible condition and in good order. Do not use record documents for construction purposes. Make documents and samples available for inspection by CONTRACTOR or OWNER. Failure to properly

maintain record documents may be reason to delay a portion of progress payments until records comply with Contract Documents.

3.1.2 Storage

Store documents and samples in SUBCONTRACTOR'S field office apart from documents used for construction.

- a. Provide files and racks for storage of documents.
- b. Provide secure storage space for storage of samples.

3.2 RECORD DOCUMENTS

3.2.2 Labeling

Label each document "PROJECT RECORD" in neat, large printed letters.

3.2.3 Alterations

Maintain record set of Drawings and Specifications legibly annotated to show all changes made during construction.

- a. Graphically depict changes by modifying or adding to plans, details, or sections. Changes in horizontal location and associated elevations shall be transmitted to the CONTRACTOR via the survey data; however, obvious changes to the plans shall be noted on the Drawings with reference to survey data providing more precise information.
- b. Make changes on each sheet affected by changes.
- c. Do not conceal Work until required information is recorded.
- d. Record changes made by Written Amendment, Field Order, Change Order or Work Directive Change.

3.2.4 Drawings

3.2.4.1 General

- a. Horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
- b. Location of utilities and appurtenances concealed in construction, referenced to visible and accessible features of structure.
- c. Field changes.
- d. Details not on original Drawings.

3.2.4.2 Specifications

- a. Mark Specification sections: to show substantial variations in actual Work performed in comparison with test of Specifications and modifications. Give particular attention to substitutions, selection of options and similar information on elements that are concealed or cannot otherwise be readily discerned later by direct observation.
- b. Note related record drawing information and Product Data.

SECTION 01900

MATERIAL, VEHICLE, AND EQUIPMENT DECONTAMINATION

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

Prior to introduction of personnel or equipment into the work area, the SUBCONTRACTOR shall provide a pad for decontamination of equipment, vehicles, and personnel. The SUBCONTRACTOR is responsible for submitting a detail drawing of the proposed pad, a plan for maintaining the pad, and the proposed pad location to the CONTRACTOR for approval.

PART 2 PRODUCTS

The pad shall be constructed of a durable leak proof material capable of containing all wash and rinse water anticipated for each wash event. The pad must contain a collection sump which is pumped down as needed to prevent overflow from the decontamination area.

PART 3 EXECUTION

- C Wash water from the decontamination area shall be collected and disposed of as stated in Section 02720: CONTAMINATED LIQUIDS REMOVAL.
- C Solids from the decontamination area shall be collected and either solidified and placed under the landfill cap, or stored and tested for disposal as stated in the Waste Management Plan, contained in Appendix C of the Draft - Landfills 2, 5, and 6 Cap Installation Project Work Plan, dated November 1995 (or latest revised version).
- C The pad shall also be used to clean the tires of vehicles leaving Landfill 2, if needed.
- C The pad shall be removed upon completion of the project.

SECTION 02110
SITE PREPARATION

PART 1 GENERAL

1.1 SUMMARY

Section Includes:

1. Protection.
2. Preparation.
3. Clearing and grubbing.
4. Restoration.

1.2 DEFINITIONS

1.2.1 Structures and Surface Features

Existing structures and surface features including buildings, pavements, curb and gutter, signs, posts, fences, trees, shrubs, landscaped surface features, and other miscellaneous items.

1.2.2 Utilities

Existing gas mains, water mains, steam lines, electric lines and conduits, telephone and other communication lines and conduits, sewer pipe, cable television, other utilities, and appurtenances.

1.2.3 Clearing and Grubbing

Cutting and disposing of trees, brush, windfalls, logs, grasses, and other vegetation, and removing and disposing of roots, stumps, stubs, grubs, logs, and other timber.

1.3 PROJECT/SITE CONDITIONS

Do not block or obstruct roads or streets with excavated or grubbed materials, except as authorized by the CONTRACTOR.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 PROTECTION

Existing utilities shall be protected against damage. Fort Carson personnel shall be contacted for marking (or verifying) utility locations before beginning excavation. If excavation work is being performed within the immediate area (10 feet) of existing buried utilities, existing underground utilities shall be located by hand excavation. If uncharted utilities are encountered during excavation, stop work in the immediate area or as appropriate and notify CONTRACTOR and the appropriate utility provider. Damaged utilities shall be repaired at the SUBCONTRACTOR'S expense.

The SUBCONTRACTOR shall preserve and protect groundwater monitoring wells. Damaged or destroyed monitoring wells shall be replaced at SUBCONTRACTOR'S expense. SUBCONTRACTOR shall protect, support, and maintain conduits, wires, pipes or other utilities that are to remain in place during work.

3.2 PREPARATION

The SUBCONTRACTOR shall provide 3 working days notice, prior to beginning construction, to owners of existing utilities, structures, and surface features. Obstructions such as fences, culverts, end walls, and guard posts shall be removed and replaced when need for removal is completed. The SUBCONTRACTOR shall provide stormwater discharge and erosion control.

3.3 CLEARING AND GRUBBING

The SUBCONTRACTOR shall clear and grub to provide access to construction area, drives, and where grade is to be raised of shrubs, trees, stumps, vegetation, rubbish, and other perishable or objectionable matter. Stumps shall be grubbed to depth of not less than 12 inches below original ground surface or subgrade. Cleared material shall be relocated within fill area for disposal under the final cap barrier layer. Cleared material shall be compacted and densified within fill area by blending with waste soil and traversing maximum 2 foot thick lifts with a minimum of 5 passes with a CAT 825C compactor or alternate piece of equipment approved by CONTRACTOR. For Landfill 2, place any cleared material within the limits of the landfill cap.

3.4 RESTORATION

Existing utilities, surface features, and structures shall be restored to condition equal to condition which existed prior to construction. Damaged landscape work within and outside of construction limits shall be replaced to original condition or better in accordance with Section 02930.

SECTION 02222

MASS EXCAVATION AND FINAL CAP SUBGRADE PREPARATION

PART 1 GENERAL

1.1 SUMMARY

Section Includes:

1. Excavation for waste relocation.
2. Site grading to achieve final cap subgrade elevation.

1.2 DEFINITIONS

1.2.1 Waste

Man made materials which may be mixed with soils (e.g., municipal waste; construction, demolition, or municipal waste within a soil matrix). Waste may also be contaminated soil with or without waste mixed within the soil (e.g., soil contaminated with oil).

1.2.2 Non-Waste Soils

In situ soils or rock which do not contain waste materials and which were naturally deposited in their present location, or uncontaminated soil or rock which has been relocated (e.g., non-waste soil fill).

1.2.3 Controlled Fill

Soil from an approved (per CONTRACTOR) borrow source which is free of waste materials and free of ice or snow, organic soils, vegetation, wood, peat, stones larger than 6 in. in any direction, or other unsuitable material. Controlled fill shall be a material which is readily capable of being compacted as an engineered fill material.

1.3 SUBMITTALS

SD-01\Data\

Equipment\

List of proposed equipment to be used in performance of construction work including descriptive data.

PART 2 MATERIALS

2.1 CONTROLLED FILL

If required, supply per definition above.

PART 3 EXECUTION

3.1 PREPARATION

Certain areas of the landfill are designated for excavation and others for fill to meet final cap subgrade elevation (see Drawings). Waste shall be excavated from designated areas per the Drawings and relocated to designated fill areas per the Drawings. Waste excavated within rework areas shall be placed under the final cap in the rework area. Other material excavated within the rework area to be used as barrier layer and frost protection soil shall be placed according to section 02244 Low Permeability Cap.

1. Place erosion protection per Section 02930.
2. After clearing and grubbing (Section 02110), check for wet soils and disc or otherwise allow to dry prior to placing fill.
3. Proof roll fill area to receive fill in order to identify areas of soft material. Deflection of 6 in. is considered soft when traversed with fully loaded, wheeled, heavy construction equipment.
4. Remove soft material and replace with soil or waste fill, **or bridge the area with material capable of adequately limiting deflection.** Proof roll and repeat as necessary.
5. Any removed material shall be set aside and allowed to dry to reduce moisture content. This material will also be used at a later time as fill to reach final cap subgrade elevation.
6. Remove ice, snow, and frozen material from fill area prior to beginning placement.

3.2 SITE GRADING

Uniformly grade areas to smooth surface, free from irregular surface changes. Grade to cross sections, lines, and elevations indicated.

1. Provide smooth transition between existing adjacent grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to conform to required surface tolerances.

3.3 EXCAVATION

1. Excavate within limits of Project to lines, grades, and elevations shown on Drawings.
2. Transport excavated materials to fill area.
3. Proof roll final excavation surface and over excavate to remove excessively soft or unsuitable material which will not form an adequate subgrade for the final cap barrier layer. Replace with controlled fill and compact. Repeat proof rolling and replacement procedure if necessary in corrected area.
4. If waste materials extend beyond the limit of excavation shown on the Drawings, it shall be relocated within the final limit of landfill and capped. Placement of engineered backfill may be required to maintain positive drainage if excavation extends beyond the limit of excavation shown on the Drawings, or below excavation grades shown. Discuss with CONTRACTOR prior to extending excavation beyond limits or grades shown on the Drawings.

3.4 DEWATERING

1. Maintain surface water control and free drainage.
2. Provide surface water pumps, hoses and other necessary equipment and labor to keep excavation free of standing water. Water coming in contact with waste shall be collected and disposed per Section 02720.

3.5 MATERIAL PLACEMENT

1. Scarify prepared surface before placement of fill material to provide bonding between materials.
2. Begin construction of waste fill at lowest point of fill below grade and construct in layers by spreading and leveling material during placement. Spread individual layers to uniform thickness throughout and approximately parallel with finished grade within current working area of fill placement. Step transition between work areas as filling progresses to prevent vertical joints within fill.
3. Place materials uniformly in maximum 1-foot loose lifts within current working area of fill placement.

4. Compact materials by traversing with a minimum of 5 passes with a CAT 825C compactor or alternate piece of equipment approved by CONTRACTOR before placing next lift.
5. Maintain lifts to provide positive drainage away from construction.
6. Where material for fill consists of rock, rubble, or waste material of such size as to render placing in 1-foot layers impractical, material may be placed in layers not exceeding in thickness approximate average size of larger materials provided individual pieces are so placed that there will be no nesting, and voids are filled with smaller soil waste materials.
7. Do not place frozen materials, and do not place materials on frozen surfaces.

3.6 FIELD QUALITY CONTROL BY CONTRACTOR

3.6.1 Testing

3.6.1.1 Compaction of waste materials

Observation and documentation of compaction methods including lift thickness, type of equipment used, and number of passes.

3.6.1.2 Controlled Fill

Observation and documentation of corrected areas including placement and compaction of controlled fill, with follow up proof rolling.

3.6.2 Tolerances

Excavation and final cap barrier layer subgrade 0.5 feet horizontal and +0 to -0.2 feet vertical unless approved in writing by CONTRACTOR.

3.6.3 Final Grades

Completed excavation grades and finished fill grades to achieve final cap barrier layer subgrade shall be surveyed by SUBCONTRACTOR and approved by CONTRACTOR before further placement of final cap materials.

SECTION 02244

LOW PERMEABILITY CAP

PART 1 GENERAL

1.1 SUMMARY

Low permeability cap to include a barrier layer and a frost protection layer at location and thicknesses specified on the Drawings. **Unsuitable materials for the barrier layer include peat, organic soils, and materials containing slag, cinders, foundry sand, debris, rubble or frozen soils, and material not meeting requirements of Specifications. Unsuitable materials for the frost protection layer include peat, and materials containing slag, cinders, foundry sand, debris, rubble or frozen soils, and material not meeting requirements of Specifications.**

1.2 SUBMITTALS

The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

SD-01 DATA\

Approval of materials\

Material sources and material test results prior to field use.

1.3 DEFINITIONS

1.3.1 Lift

Constructed segment of layer comprised of like materials spread over contiguous area and compacted prior to placing additional loose materials.

1.3.2 Layer

Contiguous (compacted) stratum of material. Where comprised of several lifts, free of construction joints or lamination between lifts.

1.4 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by designation only.

American Society for Testing and Materials (ASTM):

ASTM D422-63	Standard Test Method for Particle-Size Analysis of Soils
ASTM D4318-93	Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D2216-92	Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock.

ASTM D4643-93 Standard Test Method for Determination of Water (Moisture) Content of Soil by the Microwave Oven Method.

ASTM D3017-88	Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
ASTM D698-91	Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft ³ (600 kN-m/m ³)).
ASTM D1557-91	Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft ³ (2,700 kN-m/m ³)).
ASTM D5084-90	Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter.

1.5 QUALITY ASSURANCE AND QUALITY CONTROL

Quality assurance will be performed by CONTRACTOR in accordance with the Draft Construction Quality Assurance Plan, contained in Appendix E of the Draft - Landfills 2, 5, and 6 Cap Installation Project Work Plan, dated November 1995, or latest revised version.

Quality control shall be performed by the SUBCONTRACTOR as the SUBCONTRACTOR deems necessary to construct in accordance with the Drawings, Specifications, and associated contract documents. In addition, the SUBCONTRACTOR shall perform quality control testing in accordance with the Quality Control portion of the Draft Construction Quality Assurance Plan, contained in Appendix E of the Draft - Landfills 2, 5, and 6 Cap Installation Project Work Plan, dated November 1995, or latest revised version. Quality control information generated by the SUBCONTRACTOR shall be forwarded to the CONTRACTOR.

Quality assurance and quality control testing performed by the CONTRACTOR does not relieve the SUBCONTRACTOR from performing quality control testing, nor does it relieve the SUBCONTRACTOR from constructing to meet project requirements; however, the CONTRACTOR will make quality assurance testing available to the SUBCONTRACTOR at the SUBCONTRACTOR'S request, and the CONTRACTOR will inform the SUBCONTRACTOR (as soon as is reasonably possible) of tested items, materials, and observations which do not meet project Specifications.

1.6 PROJECT/SITE CONDITIONS

Do not block or obstruct roads, streets or pavements with excavated materials, except as authorized by CONTRACTOR. Schedule Work in coordinated effort with CONTRACTOR.

PART 2 PRODUCTS

2.1 BARRIER LAYER

2.1.1 Properties

Permeability: In-place (recompacted vertically oriented permeability), 5×10^{-7} cm/sec or less.

2.2 FROST PROTECTION LAYER

2.2.1 Properties

Permeability: With the exception of the top 4 inches, which is designated to be topsoil, the in-place (recompacted vertically oriented permeability), 5×10^{-5} cm/sec or less.

2.3 SOURCE OF MATERIAL

SUBCONTRACTOR is responsible for locating adequate borrow source material that will meet requirements of Specifications. SUBCONTRACTOR shall provide prequalification testing results to CONTRACTOR for approval prior to placing material. Material prequalification testing shall be conducted in a manner so as to develop data to establish a relationship or target window values between design criteria such as permeability and the density/moisture content of a recompacted material (e.g., barrier layer material). This data shall be used in the evaluation of actual constructed structures by comparing field test results for compaction against target window values established during the prequalification laboratory testing. A minimum of five passing permeability tests shall be performed to establish the target window values. Additional testing to establish the target window shall be performed during construction if the borrow material begins to vary. The SUBCONTRACTOR is to perform additional testing independent of direction from the CONTRACTOR if material is observed to be changing during construction. However, the CONTRACTOR will notify the SUBCONTRACTOR that additional testing is required to re-establish a target window if the CONTRACTOR observes a material change as part of the CQA testing.

The material prequalification soil testing shall be assigned by the SUBCONTRACTOR. Some prequalification testing may be available from the CONTRACTOR; however, the SUBCONTRACTOR shall determine the adequacy and thoroughness of the testing, and augment the testing as considered necessary so that actual construction of the materials may be performed to meet the objectives of the Specifications. The testing of borrow material to characterize material as an appropriate source shall include the following, with a minimum of one test per 10,000 cubic yards of material to be used per borrow source:

- a. Grain size with hydrometer analysis, ASTM D422.
- b. Atterberg Limits, ASTM D4318.
- c. Moisture Content, ASTM D2216.
- d. Standard Proctor Density, ASTM D698, or Modified Proctor Density, ASTM D1557.
- e. Remolded Permeability, ASTM D5084.
- f. Chemical Analysis, testing parameters per CONTRACTOR.

Load and haul material to project site after borrow source material has been approved by CONTRACTOR.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

For areas where no relocated waste fill has been placed or where no excavation has been performed, but which are to receive cap materials, proof roll and examine surfaces to receive cap materials to determine the existence of soft areas, areas loosened by frost action or softened by flooding or weather.

1. Place erosion protection.
2. After clearing and grubbing (Section 02110), check for wet soils and disc to dry, or otherwise allow to dry prior to placing cap materials.
3. Proof roll fill area to receive cap materials in order to identify areas of soft material. Deflection of 6 in. is considered soft when traversed with fully loaded, wheeled, heavy construction equipment.
4. Remove soft material and replace with soil or waste fill as necessary to limit deflection, or bridge the area with material capable of adequately limiting deflection. Proof roll, correct, and repeat as necessary.
5. Any removed material shall be set aside and allowed to dry to reduce moisture content. This material shall be handled and located in a manner so that it is capped by the final cap barrier layer and the frost protection layer.

3.1.1 Frozen Materials

Remove ice, snow, and frozen material from fill area prior to beginning placement of cap materials.

3.1.2 Moisture Conditioning

Moisten areas appearing too dry to receive barrier layer material. Apply water too facilitate bonding between the barrier layer and the subbase.

3.1.3 Erosion Control

1. SUBCONTRACTOR is responsible for surface water management within construction limits.
2. Install silt fencing, straw bales and other CONTRACTOR approved controls to prevent offsite sediment runoff in areas which may result from this work.
3. Keep construction and borrow areas well drained and minimize surface water ponding.

3.1.4 Dewatering

Subsurface dewatering not permitted without CONTRACTOR'S permission.

3.1.5 Water Sources

Water sources used for moisture conditioning soil shall be approved by CONTRACTOR.

3.2 PLACEMENT OF BARRIER LAYER MATERIAL

Do not place barrier layer material until the cap subbase elevation has been surveyed by SUBCONTRACTOR'S survey crew, and the surface has been observed, documented, and approved by CONTRACTOR.

3.2.1 Placement

Soil used to construct the barrier layer shall be approved by the CONTRACTOR prior to placement. Place barrier layer in accordance with the following:

1. Maximum Loose Lift Thickness: 8 inches.
2. Maximum Compacted Lift Thickness: 6 inches, or length of tooth on sheepsfoot compactor used, whichever is less.
3. Minimum Barrier Layer Thickness After Compaction: 2.0 feet.
4. Maximum Allowable Variation from Design Elevations of Barrier Layer: -0 to +0.7 feet.
5. Maximum Soil Clod Size Prior to Compaction: 3 inches.
6. Maximum In-Place Soil Permeability: 5×10^{-7} cm/sec, as determined by ASTM D5084.

3.2.2 Scarification

Scarify initial surface and scarify each lift surface if necessary to facilitate bonding between lifts. Scarifying techniques and surface shall be approved by the CONTRACTOR prior to material placement. If desiccation of the lift surface occurs during construction, it shall be corrected prior to further placement of soil. Each lift shall have a maximum permeability of 5×10^{-7} cm/sec.

3.2.3 Compaction

Compact each lift using a heavy sheepsfoot compactor with compactor feet at least as long as the compacted lift thickness to facilitate bonding between lifts.

3.2.4 Moisture Conditioning

Moisture condition soil and blend (by discing or tilling) to achieve adequate uniformity for compaction. Each lift shall be compacted to moisture and density capable of achieving the specified permeability. In addition, the moisture content shall not be too high so as to prevent the sheepsfoot compactor from **A**walking out**@**f each lift of material placed.

3.2.5 Temperature Restrictions

Do not place soil below ambient air temperatures of 32°F, unless SUBCONTRACTOR can demonstrate fill material temperature is above freezing.

3.2.6 Control of Lift Thickness

Control lift thickness using laser-guided equipment, construction staking or other method acceptable to CONTRACTOR per Section 01050 to ensure requirements of Specifications met.

3.2.7 Stake Removal

Completely remove stakes or hubs placed in barrier layer, and correct any holes or uncompacted materials.

3.2.8 Rework

Rework or remove and replace portions of barrier layer not meeting Specification requirements.

3.2.9 Clods

Soil clods larger than specified maximum shall be broken down to size less than or equivalent to specified maximum prior to lift compaction.

3.2.10 Frozen Materials

Remove ice and snow during cold weather construction prior to placing lift. Do not use frozen soil in barrier layer.

3.2.11 Freeze-Thaw

Recompact or rework soil impacted by freeze-thaw cycle during construction activity.

3.2.12 Dessication Protection

Smooth-drum roll or blade the finished top of barrier layer to a smooth tight surface prior to performing survey work for certification. Maintain top surface of barrier layer against desiccation (until overlying frost protection layer material is placed) by overbuilding the barrier layer one lift (approximately 6 inches) using barrier layer material and specifications (overbuilding to be done before smooth-drum rolling or blading). The overbuilt portion may be allowed to weather to frost protection layer material specifications. Alternately, the barrier layer surface may be protected against desiccation by periodically applying moisture and maintaining the upper surface of the barrier layer until the frost protection layer is applied.

If overbuilding is the method chosen by the SUBCONTRACTOR, within one day prior to placing frost protection layer material, random samples of the barrier layer at the top of the 2 foot thick elevation (i.e., directly below the overbuilt lift) shall be obtained by the CONTRACTOR within the subject area, and the moisture content of the soil shall be checked (using ASTM D2216 or D 4643) to ensure that the barrier layer material within the minimum 2 foot required thickness is still within the target values established for obtaining the specified permeability. SUBCONTRACTOR shall replace or

correct material which does not meet Specifications. CONTRACTOR shall be notified by the SUBCONTRACTOR of corrected areas so that quality assurance testing may be performed.

3.3 PLACEMENT OF FROST PROTECTION LAYER

Do not place frost protection material until the top of the cap barrier layer elevation has been surveyed by SUBCONTRACTOR'S survey crew, and the surface has been observed, documented, and approved by CONTRACTOR.

3.3.1 Placement

Place frost protection layer in accordance with the following:

1. Maximum Compacted Lift Thickness: 12 inches.
2. Minimum Frost Protection Layer Thickness After Compaction: 2 feet 6 inches. Overbuilt portion of the barrier layer may be applied to the thickness of the frost protection layer.
3. Maximum Allowable Variation from Design Elevations of Barrier Layer: -0 to +0.2 feet.
4. Maximum Soil Clod Size Prior to Compaction: 3 inches.
5. Maximum In-Place Soil Permeability: 5×10^{-5} cm/sec, as determined by ASTM D5084.

3.3.2 Scarification

Scarify initial surface and scarify each lift surface if necessary to facilitate bonding between lifts. Surface grade to fill desiccation cracks that may be present. In addition, where overbuilding has occurred, CONTRACTOR shall randomly test the moisture content of the overbuilt portion (using ASTM D2216, D 4643, or D3017 - do not use Method D3017 over liner transition area where geomembrane has been placed) to ensure that the overbuilt portion meets the required target values established for obtaining the specified permeability for the frost protection layer. SUBCONTRACTOR shall replace or correct material which does not meet Specifications. CONTRACTOR shall be notified by the SUBCONTRACTOR of corrected areas so that quality assurance testing may be performed. Scarifying techniques and surfaces shall be approved by the CONTRACTOR prior to material placement. Each lift shall have a maximum permeability of 5×10^{-5} cm/sec.

3.3.3 Compaction

Compact each lift using a heavy sheepsfoot compactor capable of facilitating bonding between lifts.

3.3.4 Moisture Conditioning

Moisture condition soil and blend (by discing or tilling) to achieve adequate uniformity for compaction. Each lift shall be compacted to moisture and density capable of achieving the specified permeability. In addition, the moisture content shall not be too high so as to prevent the sheepsfoot compactor from ~~Walking out~~ of each lift of material placed.

3.3.5 Temperature Restrictions

Do not place soil below ambient air temperatures of 32°F, unless SUBCONTRACTOR can demonstrate fill material temperature is above freezing.

3.3.6 Control of Lift Thickness

Control lift thickness using laser-guided equipment, construction staking or other method acceptable to CONTRACTOR per Section 01050 to ensure requirements of Specifications met.

3.3.7 Stake Removal

Completely remove stakes or hubs placed in frost protection layer, and correct any holes or uncompacted materials.

3.3.8 Rework

Rework or remove and replace portions of frost protection layer not meeting Specification requirements.

3.3.9 Clods

Soil clods larger than specified maximum shall be broken down to size less than or equivalent to specified maximum prior to lift compaction.

3.3.10 Frozen Materials

Remove ice and snow during cold weather construction prior to placing lift. Do not use frozen soil in frost protection layer.

3.3.11 Freeze-Thaw

Recompact or rework soil impacted by freeze-thaw cycle during construction activity.

3.3.12 Surface Finish

Smooth-drum roll or blade finished top of frost protection layer to a smooth tight surface prior to performing survey work for certification.

3.3.13 Placement of Topsoil

Following placement of 2 feet 6 inches of frost protective soils, the uppermost 4 inches of the protective soils shall be amended (see Section 02930) to form a vegetative layer that functions as topsoil.

3.4 REWORKING OF IN-PLACE CAP

Areas of the in-place low permeability cap that will be reworked shall be designated by CONTRACTOR. These areas shall be reworked by the SUBCONTRACTOR in accordance with the following sections.

3.4.1 Excavation of In-Place Cap

The in-place cap to be reworked shall be excavated using equipment designated by SUBCONTRACTOR and approved by CONTRACTOR.

3.4.2 Stockpiling Excavated Soil

Suitable excavated material that will be used for reworking shall be placed in accordance with requirements given in this specification, or shall be separately stockpiled if it cannot be readily placed. Stockpile locations shall be designated by SUBCONTRACTOR and approved by CONTRACTOR. Excavated soil containing waste shall be placed at a location to receive soil cap.

3.4.3 Placement

Placement of soil to be reworked shall follow the same procedures as outlined in Sections 3.2 and 3.3. Any modification to these procedures shall require approval of CONTRACTOR.

3.5 FIELD QUALITY CONTROL

1. Notify CONTRACTOR'S designated representative when portions of barrier layer or frost protective layer are ready for density, moisture or permeability testing.
2. Provide CONTRACTOR'S designated representative with equipment, time, and labor necessary for completion of field testing. (Example: Pushing shelby tubes for permeability testing in barrier layer.)

3.6 OTHER

Install and maintain erosion control features as shown on Drawings.

SECTION 02245

STONE (RIPRAP) PROTECTION

PART 1 GENERAL

1.1 SUMMARY

This specification section covers the supply, installation, and testing of stone protection materials for the channel and slopes of the embankment as shown on the Drawings. The SUBCONTRACTOR shall perform all sampling and testing required for quality control in accordance with Section 01440 and as specified herein. All activities performed by the SUBCONTRACTOR or any subcontractor at any tier shall be in accordance with all applicable Federal, State, and local laws and regulations.

1.2 SUBMITTALS

The following shall be submitted in accordance with Section 01305 SUBMITTAL PROCEDURES:

SD-01 Data\

Equipment\

List of proposed equipment to be used in performance of construction work including descriptive data.

SD-09 Reports\

Test Results\

Field Gradation Test Results mailed within ten (10) days after completion of the tests.

SD-18 Records\

Stone Protection\

Initial tests, source, legal description, Geologic Record and Service Record for stone protection.

Waybills and Delivery Tickets\

Certified waybills and delivery tickets for all aggregates

1.3 UNIT PRICES

1.3.1 *Waybills and Delivery Tickets*

Copies of waybills and delivery tickets shall be submitted during the progress of the work. Before the final payment is allowed, SUBCONTRACTOR shall file certified waybills and certified delivery tickets for all material actually used.

1.3.2 Measurement

Deductions will be made for any material wasted, unused, rejected, or used for the convenience of SUBCONTRACTOR.

1.4 *EQUIPMENT*\

All equipment, and tools used in the performance of the work will be subject to approval before the work is started and shall be maintained in satisfactory working condition at all times.

1.5 QUALITY ASSURANCE AND QUALITY CONTROL

Quality assurance will be performed by CONTRACTOR in accordance with the Draft Construction Quality Assurance Plan, contained in Appendix E of the Draft - Landfills 2, 5, and 6 Cap Installation Project Work Plan, dated November 1995, or latest revised version.

Quality control shall be performed by the SUBCONTRACTOR as the SUBCONTRACTOR deems necessary to construct in accordance with the Drawings, Specifications, and associated contract documents. In addition, the SUBCONTRACTOR shall perform quality control testing in accordance with the Quality Control portion of the Draft Construction Quality Assurance Plan, contained in Appendix E of the Draft - Landfills 2, 5, and 6 Cap Installation Project Work Plan, dated November 1995, or latest revised version. Quality control information generated by the SUBCONTRACTOR shall be forwarded to the CONTRACTOR.

Quality assurance and quality control testing performed by the CONTRACTOR does not relieve the SUBCONTRACTOR from performing quality control testing, nor does it relieve the SUBCONTRACTOR from constructing to meet project requirements; however, the CONTRACTOR will make quality assurance testing available to the SUBCONTRACTOR at the SUBCONTRACTOR'S request, and the CONTRACTOR will inform the SUBCONTRACTOR (as soon as is reasonably possible) of tested items, materials, and observations which do not meet project Specifications.

1.5.1 *Testing and Sampling*\

All quality control testing and sampling shall be the responsibility of SUBCONTRACTOR.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Bedding Material

Bedding material shall consist of sand, gravel, or crushed stone with 3-in. maximum size. Bedding material shall be composed of tough, durable particles, reasonably free from thin, flat, and elongated particles and containing no organic or soft friable particles in quantities objectionable by the CONTRACTOR. Uniform gradations shall be within the following limits:

<u>Sieve Size</u>	<u>Percent Passing by Weight</u>
3"	90-100
3/4"	20-90
#4	0-20
#200	0-3

2.1.2 Riprap

Stone used for riprap shall be hard, dense, angular in shape, resistant to weathering, and free from seams, cracks or other structural defects. The stone shall have a specific gravity of at least 2.5. Each piece shall have its greatest dimension not greater than four times its least dimension. The riprap shall be reasonably well graded from coarse to fine falling within the limits of the below gradation requirements:

<u>D₅₀ stone size¹</u> <u>(inches)</u>	<u>% of material</u> <u>smaller than</u> <u>typical stone²</u>	<u>typical stone</u> <u>dimensions³</u> <u>(inches)</u>	<u>typical stone</u> <u>weight⁴</u> <u>(pounds)</u>
6	70-100	12	85
	50-70	9	35
	35-50	6	10
	2-10	2	0.4
9	70-100	15	160
	50-70	12	85
	35-50	9	35
	2-10	3	1.3
12	70-100	21	440
	50-70	18	275
	35-50	12	85
	2-10	4	3
18	100	30	1280
	50-70	24	650
	35-50	18	275
	2-10	6	10

¹D₅₀ = Nominal stone size

²Based on typical rock weight

³Equivalent spherical diameter

⁴Based on specific gravity=2.5

Control of gradation will be by visual inspection. A sample consisting of 2 to 8 tons shall be taken of material delivered to the job and checked for gradation and elongation. The material from the initial test that meets specifications shall be placed in a well marked area as designated by the CONTRACTOR to serve as a visual model for acceptable material. Material that does not meet specifications shall not be counted as a required test. The SUBCONTRACTOR shall state in writing the method used in blasting, processing, loading, and handling this sample, and shall notify the CONTRACTOR any time any production methods are changed. Riprap material shall not be placed until the material delivered to the job has passed a visual field gradation test. At the discretion of the CONTRACTOR or his representative, random loads will be dumped or the in-place material will be sampled and a gradation control check shall be performed by the SUBCONTRACTOR at the discretion and under the supervision of the CONTRACTOR. If the materials fail to meet the gradation limits as specified, the SUBCONTRACTOR shall discontinue placement of material and adjust his operations and verify with the necessary tests that acceptable materials are being produced or he shall propose another source and verify with the necessary tests that acceptable materials can be produced from that source. Tests which do not pass the gradation requirements will not be counted in the additional required tests above. If, at any time, the materials fail to meet the limits as specified, the SUBCONTRACTOR shall adjust his operations or he shall propose another source. All field tests will be performed by and at the expense of the SUBCONTRACTOR.

2.1.2.1 Bulk Specific Gravity

Bulk specific gravity shall be computed based on the Corps of Engineers Test Method CRD-C107-82 with modifications as listed below. Stone protection material shall be tested in a saturated surface-dry (SSD) condition. The computed bulk specific gravity so determined shall not be less than 2.5.

Corps of Engineers Test Method CRD-C107-82 shall be modified as follows:

Total sample shall weigh 5000 grams +2 percent.

Individual particles shall weigh approximately 300 grams each.

2.1.2.2 Soundness in Magnesium Sulfate

Soundness in magnesium sulfate shall be determined according to ASTM Standard C88-76 with test modifications as listed below. The combined loss at 5 cycles shall be not more than 8 percent.

ASTM Standard C88-76 shall be modified as follows:

C Sample Preparation

The sample shall be prepared by breaking it into fragments reasonably uniform in size and shape and weighing approximately 100 grams each. The test sample shall weigh 5000 grams \pm 2 percent. The sample shall be thoroughly washed and dried previous to test as described for coarse aggregate.

C Sample Immersion and Temperature

The sample immersed in the solution shall be maintained at a temperature of 80 degrees \pm 2 degrees F for the immersion period.

C Quantitative Examination

At the end of the fifth cycle, the percentage loss shall be determined by the three following methods. The test report shall show the loss computed by each method; however, only the combined loss shall be used for acceptance or rejection of the material.

C Loss by Breaking

An individual piece which has broken or split into three or more fragments shall be considered to have failed the test, provided each of the three such fragments is at least 10 percent of the original piece by weight. The total original weight of all pieces failing the test, expressed as percentage of the total original weight of the sample, shall be considered as percentage loss by breaking.

C Loss by Crumbling and Flaking

After the loss by breaking has been determined, the pieces that have not failed in that determination shall be screened on the 1/2-inch sieve and the material retained on the sieve shall be weighed for purposes required to determine combined losses. The pieces which have failed by breaking shall then be added to the material remaining on the 1/2-inch sieve and screened. The difference between the total original weight of the sample and the total weight of the material retained on the 1/2-inch sieve expressed as percentage of the total original weight, shall be considered as percentage loss by crumbling and flaking.

C Combined Loss

The difference between the total original weight of the sample and the weight of the material retained on the 1/2-inch sieve, after screening the pieces which did not fail by breaking, expressed as percentage of the total original weight, shall be considered as percentage combined loss.

C Stone Protection Report

The report for stone protection rock shall show the percentages of loss calculated as described hereinbefore and the number of pieces affected, classified as to number disintegrating, splitting, crumbling, cracking, flaking, etc.

C Soundness in Freezing and Thawing

The test for freezing and thawing shall consist of AASHTO T103-78, Ledge Rock Method, Procedure C, modified as indicated below. The loss at 12 cycles shall not exceed 5.0 percent.

C Temperature

The temperature of the surrounding medium during freezing shall be maintained in the range of -20 to -10 degrees F.

C Freeze/Thaw Cycle

The length of a freezing and thawing cycle shall be sufficient to totally freeze and totally thaw each piece of the same during each cycle. The laboratory shall specifically determine for each sample that the cycle used is sufficient to accomplish total freezing and total thawing and shall report this in the test report. However, in no case shall the cycle consist of less than 2-1/2 hours of freezing followed by 1 hour of thawing. The sample shall be held in the frozen condition whenever necessary to break the cycle (overnight, weekends, etc.).

C Immersion

Procedure C, Partial Immersion shall be used, except that soaking prior to testing shall be in accordance with Procedure A.

C Test Reports

Test reports shall describe type of failure of the discrete particles.

2.1.3 Grout

Uniformly graded from coarse to fine, conforming to the following gradation:

<u>Sieve Size</u>	<u>Percent Passing by Weight</u>
3/8"	100
#4	95-100
#16	45-80
#50	10-30
#100	2-10

2.1.4 Separation Fabric

Refer to Section 02276 for separation fabric requirements.

2.1.5 Sampling and Testing

2.1.5.1 General

The SUBCONTRACTOR shall be responsible for all sampling and testing specified herein. The CONTRACTOR or his representative may perform verification tests as determined necessary for final approval of the stone protection material. All samples including samples taken during production shall be representative of the stone protection material furnished

or proposed to be furnished. Samples shall be taken in conformance with Corps of Engineers Specification CRD C100-75, or other approved method. All sampling operations shall take place in the presence of a representative of the CONTRACTOR. At the same time samples for initial tests are obtained, the ledge or ledges in quarries sampled shall be marked with an approved semi-permanent marking which will be readily visible during the period of riprap production. No rock shall be furnished from any ledge which has not been sampled, tested, and approved for use on this project.

2.1.5.2 Initial Test

Initial tests only will be required. The following tests shall be performed on samples of material obtained from each ledge proposed for use as stone protection prior to start of construction:

- Bulk Specific Gravity
- Soundness in Magnesium Sulfate
- Soundness in Freezing and Thawing

Certified test results performed not longer than 12 months prior to delivery to the project together with the name of the owner of the quarry and the legal description shall be submitted to the CONTRACTOR. In addition, the SUBCONTRACTOR shall submit a geologic section of each quarry proposed for use with the various rock unit identified by geologic name of formation and member and indicate from what ledge the samples were obtained.

PART 3 EXECUTION

3.1 PREPARATION

Areas on which filter fabric, bedding material, and riprap are to be placed shall be graded and dressed to lines and grades shown on drawings or as required by CONTRACTOR in accordance with Section 02110. Eroded or washed out areas shall be repaired prior to placement of material.

3.2 FILTER FABRIC

Place filter fabric on prepared surface according to Section 02276.

3.3 BEDDING MATERIAL

3.3.1 General

Bedding composed of the specified bedding material shall be placed on the filter fabric where required within the limits and thickness shown on the drawings or as staked in the field, to form a backing for the riprap protection. Gradation tests shall be performed on this material after it has been placed on the slope from locations directed by the CONTRACTOR. Samples shall be taken for each 1,500 square yards of each layer of material placed in each area.

3.3.2 Placement

Bedding material shall be spread uniformly from downslope to upslope using a low ground pressure dozer (or equipment approved by the CONTRACTOR) on the filter fabric in a satisfactory manner to the slope lines, thickness, and grades indicated on the drawings or as directed. Placing of material by methods which will tend to segregate particle sizes within the bedding will not be permitted. Any damage to the surface of the bedding foundation during placing of the bedding shall be repaired before proceeding with the work. Compaction of the bedding material will not be required but it shall be finished to present a reasonably even surface free from depressions, mounds, or windrows.

3.4 RIPRAP

3.4.1 General

Riprap shall be placed on the bedding material within the limits shown on the drawings or otherwise required by the CONTRACTOR. The riprap shall consist of stone meeting the requirements hereinbefore specified.

3.4.2 Field Gradation

A visual field gradation test of riprap material shall be performed by the CONTRACTOR to determine if the material as delivered to the job meets the gradation requirements of this specification.

3.4.3 Placement

Riprap stone shall be placed in such manner as to produce a reasonably well-graded mass of rock with the minimum practicable percentage of voids. Riprap shall be placed to its full course thickness in one operation and in such manner as to avoid damage to the bedding material and to minimize segregation of the riprap. The larger stones shall be well distributed and the entire mass of stones in their final position shall be roughly graded to conform to the gradation specified. The finished riprap shall be free from objectionable pockets of small stones and clusters of larger stones. The desired distribution of the various sizes of stones throughout the mass shall be obtained by selective loading of the material at the quarry or other source; by controlled dumping of successive loads during final placing and placement. All stone shall be placed by means of clam, orange peel, or skip box. However, zero drop height placement procedures are to be utilized for riprap stone to avoid displacing or damaging the underlying bedding. Dumping of stone at the top of slopes and rolling or pushing into place will not be permitted. Manipulating or moving stone at any time prior to placement by means of dozers or other blade equipment will not be permitted. Rearranging of individual stones by mechanical equipment or by hand will be required to the extent necessary to obtain a reasonably well graded distribution of stone sizes as specified above. Riprap shall be placed from downslope to upslope to form a continuous buttress of rock as placement progresses.

3.5 GROUTING

Where specified on the Drawings, fill spaces between stones with cement mortar. Use sufficient amount of mortar to fill voids and leave face surface of stone exposed. Place grout from bottom to top and sweep surface with stiff broom. After grouting completed, wet cure surface. Mortar should be machine mixed unless otherwise permitted by CONTRACTOR. Use mortar within 45 minutes after mixing and do not retemper mortar.

3.6 PROTECTION

The SUBCONTRACTOR shall maintain the riprap stone until accepted and any material displaced by any cause shall be replaced at his expense to the lines and grades shown on the drawings.

SECTION 02276

GEOTEXTILE FOR SOIL RETENTION

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIAL (ASTM)

ASTM D123	Standard Terminology Relating to Textiles
ASTM D3786	Bursting Strength of Knitted Goods: Constant-Rate-of-Traverse (CRT), Ball Burst Test
ASTM D1683	Fail in Sewn Seams of Woven Fabrics
ASTM D3884	Abrasion Resistance of Textile Fabrics (Rotary Platform, Double-Head Method)
ASTM D4751	Determining the Apparent Opening Size of a Geotextile
ASTM D4632	Breaking Load and Elongation of Geotextiles (Grab Method)

FEDERAL SPECIFICATIONS (FS)

FS VV-F-800	(Rev. C; Am. 2) Fuel Oil, Diesel
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MILITARY SPECIFICATIONS (MS)

MS MIL-G-3056 (Rev. D; Am. 2)	Gasoline, Automotive, Combat
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1.2 SYSTEM DESCRIPTION

This specification section covers the supply, installation, and testing of a complete and totally functional geotextile soil retention layer (geotextile separator layer). This material will be used as a soil separator for the riprap lined channels shown on the Drawings.

1.3 SUBMITTALS

The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

SD-01 Data\

Manufacturer's Catalog Data\

Manufacturer's standard catalog data giving the brand names and catalog numbers of all geotextile system components in sufficient detail to demonstrate complete compliance with this section.

SD-06 Instructions\

Manufacturers Instructions\

The manufacturer's seaming and installation instructions and procedures.

SD-07 Statements\

Qualifications\

A letter verifying SUBCONTRACTOR meets all licensing requirements, and indicating the experience of the installer.

SD-07 Schedule\

Inspections\

A letter advising the CONTRACTOR of the inspections.

SD-09 Reports\

Seam Tests\

Seam tests will be run for evenly dispersed sections of sewn and bonded sections.

Factory Tests\

The geotextile shall demonstrate through factory testing the minimum acceptable limits.

Verification of Dimensions\

SUBCONTRACTOR shall become familiar with all details of the work, verify all dimensions in the field.

Factory Test\, *Seam Tests*\

Three copies of the information described below in a bound 8 1/2 by 11 inch booklet. Drawings shall be folded, with the title block visible, and placed in plastic pockets with reinforced holes. Manufacturer shall be responsible for verifying the integrity of the geotextile and any seams completed at the factory. The manufacturer shall perform all testing at the factory. Approval of the factory testing shall be obtained before the geotextile is shipped to the site. The SUBCONTRACTOR shall be responsible for verifying the integrity of seams completed in the field. Each section shall contain a detailed description of the test including:

- a. A list of all equipment used, with calibration certifications.
- b. A copy of all measurements taken.
- c. The date of testing.
- d. The parameters being verified.
- e. The condition specified for the parameter.
- f. The test results, signed and dated.
- g. A description of all adjustments made during the test.

SD-14 Samples\

Samples\

SUBCONTRACTOR shall provide to CONTRACTOR geotextile samples for testing to determine compliance.

1.4 *QUALIFICATIONS*

SUBCONTRACTOR shall meet the licensing requirements of the State in which the work is to be performed.

1.5 DELIVERY, STORAGE, AND HANDLING

During all periods of shipment and storage, the geotextile shall be protected from direct sunlight, ultra-violet rays, temperatures greater than 140 degrees Fahrenheit, mud, dirt, dust, and debris. To the extent possible, the fabric shall be maintained wrapped in a heavy duty protective covering.

1.6 *VERIFICATION OF DIMENSIONS*

SUBCONTRACTOR shall become familiar with all details of the work, verify all dimensions in the field, and shall advise CONTRACTOR of any discrepancy before ordering material or performing the work. No departures shall be made without the prior approval of CONTRACTOR.

1.7 QUALITY ASSURANCE AND QUALITY CONTROL

Quality assurance and quality control will be performed by CONTRACTOR in accordance with the Draft Construction Quality Assurance Plan, contained in Appendix E of the Draft - Landfills 2, 5, and 6 Cap Installation Project Work Plan, dated November 1995, or latest revised version.

Quality control shall be performed by the SUBCONTRACTOR as the SUBCONTRACTOR deems necessary to construct in accordance with the Drawings, Specifications, and associated contract documents. In addition, the SUBCONTRACTOR shall perform quality control testing in accordance with the Quality Control portion of the Draft Construction Quality Assurance Plan, contained in Appendix E of the Draft - Landfills 2, 5, and 6 Cap Installation Project Work Plan, dated November 1995, or latest revised version. Quality control information generated by the SUBCONTRACTOR shall be forwarded to the CONTRACTOR.

Quality assurance and quality control testing performed by the CONTRACTOR does not relieve the SUBCONTRACTOR from performing quality control testing, nor does it relieve the SUBCONTRACTOR from constructing to meet project requirements; however, the CONTRACTOR will make quality assurance testing available to the SUBCONTRACTOR at the SUBCONTRACTOR'S request, and the CONTRACTOR will inform the SUBCONTRACTOR (as soon as is reasonably possible) of tested items, materials, and observations which do not meet project Specifications.

PART 2 PRODUCTS

2.1 STANDARD PRODUCTS

All system components shall be the manufacturer's standard as offered in catalogs for commercial or industrial use. Any non-standard product or component and the reason for its use shall be specifically identified by SUBCONTRACTOR in any required submittal.

2.2 MATERIALS

The geotextile shall be woven pervious sheet of plastic yarn as defined by ASTM D 123. The Geotextile shall meet the physical requirements listed in Table 1 of the specifications. The geotextile fiber shall consist of a long-chain synthetic polymer composed of at least 85 percent by weight of propylene, ethylene, ester, amide, or vinylidene-chloride, and shall contain stabilizers and/or inhibitors added to the base plastic if necessary to make the filaments resistant to deterioration due to ultra-violet and heat exposure. The fabric should be fixed so that the yarns will retain their relative position with respect to each other. The edges of the fabric shall be finished to prevent the outer yarn from pulling away from the fabric.

2.2.1 *Samples*

SUBCONTRACTOR shall provide to CONTRACTOR geotextile samples for testing to determine compliance with any or all of the requirements in this specification. When samples are to be provided, they shall be submitted a minimum of 30 days prior to the beginning of installation of the same geotextile. All samples provided shall be from the same production lot as will be supplied for the contract, and shall be the full manufactured width of the geotextile by at least 10 feet long, except that samples for seam strength may be a full width sample folded over and the edges stitched for a length of at least 5 feet. Samples submitted for testing shall be identified by manufacturers lot designation.

2.2.2 *Factory Test\

SUBCONTRACTOR shall furnish CONTRACTOR, in duplicate, a mill certificate or affidavit signed by a legally authorized official from the company manufacturing the geotextile. The mill certificate or affidavit shall attest that the geotextile meets the chemical, physical, and manufacturing requirements stated in this specification. The geotextile shall demonstrate through factory testing the minimum acceptable limits of the following properties listed in Table 1.

<u>TABLE 1</u>			
<u>Properties</u>	<u>Unit</u>	<u>Method</u>	<u>Minimum</u>
Apparent Opening Size (AOS)	US Sieve	ASTM D-4751	50
Grab Strength	lbs	ASTM D-4632	200
Grab Elongation	%	ASTM D-4632	15
Trapezoid Tear Strength	lbs	ASTM D-4533	75
Puncture Resistance	lbs	ASTM D-4833	90
Mullen Burst Strength	psi	ASTM D-3786	400

Table 1 represents the physical characteristics of Amoco woven geotextile 2002. This material or a fabric demonstrating equivalent properties must be used. Variances in the material properties used must be approved by CONTRACTOR in writing.

2.3 SEAMS

The seams of the geotextile shall be sewn with thread of a material meeting the chemical requirements given above for geotextile yarn.

2.3.1 *Seam Tests\

Seams shall be tested in accordance with method ASTM D 1683, using 1-inch square jaws and 12 inches per minute constant rate of traverse. The strengths shall be not less than 90 percent of the required tensile strength (Table 1) of the unaged geotextile in any principal direction.

PART 3 EXECUTION

3.1 PREPARATION OF SURFACE

The surface upon which the geotextile is to be placed shall be graded smooth and be free of debris.

3.2 INSTALLATION OF THE GEOTEXTILE

The geotextile shall be placed in the manner and at the locations shown on the Drawings. At the time of installation, geotextile shall be rejected if it has defects, rips, holes, flaws, deterioration, or damage incurred during manufacture, transportation or storage. The geotextile shall be placed with the long dimension parallel to the long side of the area and shall be laid smooth and free of tension, stress, folds, wrinkles, or creases, the strips shall be placed to provide a minimum width of 12 inches of overlap for each joint. Any damage to the geotextile during its installation or during placement of aggregate shall be replaced by SUBCONTRACTOR at no cost to CONTRACTOR. The work shall be scheduled so that the covering of the geotextile with a layer of the specified material is accomplished within 5 days after placement of geotextile. Failure to comply shall require replacement of geotextile. The geotextile shall be protected from damage due to the placement of aggregate or other materials by limiting the drop height of cover materials. Before placement of overlying aggregate or bedding soil, SUBCONTRACTOR shall demonstrate that the placement technique will prevent damage to the geotextile. Any damaged geotextile shall be repaired by placing a patch extending three feet in all directions beyond the damaged section.

3.2.1 Roll Deployment

Only those rolls that can be anchored and seamed together the same day shall be deployed.

- a. Any equipment used shall not damage the geotextile by handling, trafficking, or other means.
- b. All personnel working on the geotextile shall not smoke, wear damaging shoes, or engage in other activities which could rut the supporting soil or aggregate.
- c. The method used to unroll the rolls shall not cause scratches or crimps in the geotextile and shall not damage the supporting soil.
- d. The method used to place the rolls shall minimize wrinkles (especially differential wrinkles between adjacent rolls).
- e. Adequate loading (e.g., sand bags), shall be placed to prevent uplift by wind without damaging the geotextile.
- f. Direct contact with geotextile shall be minimized; i.e., the geotextile in traffic areas shall be protected by extra geotextile or other suitable materials.

3.3 *INSPECTIONS*

3.3.1 Initial Inspection

A visual inspection of the geotextile shall be performed on each geotextile roll as it is unrolled. CONTRACTOR shall be notified of all visually detected damage. The visual inspection shall also verify the finished surface to be covered with the geotextile is properly graded and compacted.

3.3.2 Seam Inspection

All field seams shall be subjected to a visual inspection performed within 30 hours after the seam has been made. Where problems are noticed the geotextile shall be repaired and the area reinspected.

3.3.3 Acceptance Inspection

As soon as practicable after successful completion of the geotextile an acceptance inspection shall be performed. If the inspection reveals any defects in the work, such defects shall be repaired or the unsatisfactory work replaced before acceptance. The cost of such repairs and replacements shall be borne by SUBCONTRACTOR. SUBCONTRACTOR shall provide all materials, facilities, and equipment necessary to permit adequate inspection of all work by CONTRACTOR.

BARBED-WIRE FENCE AND GATES

1.1 SUMMARY

1.2 SUBMITTALS

Submittals which provide calculations, descriptions, or documentation regarding the work.

FEDERAL SPECIFICATIONS (Fed. Spec.).

TT-W-00571|Wood Preservation: Treating Practices (AGR-AFS)

Compressive Strength of Cylindrical Concrete Specimens

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Wood Posts and Braces

Wood posts shall be cut from cedar, Douglas fir, pine, or from other approved species of timber. Braces shall be treated No. 2 or better grade, Douglas fir or southern yellow pine. Posts shall be peeled, treated, dressed, and cured. Posts shall be cut from sound live timber, and shall contain no unsound knots. Posts shall be free from defects which detract from the strength. Posts shall be straight so that a line from the center of the butt to the center of the tip will not deviate more than 1 inch from center of the post. All posts shall taper from butt to tip and shall be of the dimensions indicated on the attached standard drawings. All wood posts and braces shall be given a pressure preservative treatment in a closed retort. The treatment shall conform to Fed. Spec. TT-W-571, and the minimum net retention shall be as specified hereinafter. Wood treated with an olive-borne preservative shall be clean, free from surface oil, and properly seasoned. Wood treated with a water-borne preservative shall be air- and kiln-dried to moisture content not exceeding 19 percent. Wood cut or sawed after treatment shall have the cut surfaces well brush-coated with the preservative used in the treatment.

2.1.2 Steel Posts

Steel posts shall be the standard product of a manufacturer specializing in fence products. Posts shall be drive type, "U" or "T" section and shall be provided with a suitable anchor plate. Steel posts shall have a minimum weight of 1.3 pounds per lineal foot and shall be hot-dip zinc-coated after fabrication, as specified hereinbelow.

2.1.3 Gates

Gate frame shall be a minimum of 1-3/8 inch o.d. tubular steel braced with a sturdy center bar and a diagonal adjustable brace wire to prevent sagging. Filler fabric shall conform to Fed. Spec. RR-F-221, Type I, Style 1, Zinc-coated, Table I, Design No. 1047-6-9. The filler fabric shall be securely tied to the framework at top, bottom, and sides. Gates shall be fitted with hinges. All material shall be hot-dipped zinc-coated.

2.1.4 Barbed Wire

Shall conform to Fed. Spec. RR-F-221, Type I, Table I, Class 3, 0.8 oz./sq. feet zinc-coated, Table II, two twisted strands of 12.5-gage wire, 4-point, 14-gage, round barbs spaced at 5-inch centers.

2.1.5 Woven Wire Fabric (Not Used)

2.1.6 Combination Barbed and Woven Wire Fence (Not Used)

2.1.7 Plain Wire

Plain wire shall conform to Fed. Spec. QQ-W-461, AISI Number 1010, 9-gage, Class 3A, zinc-coated, soft carbon steel.

2.1.8 Staples and Nails

Staples and nails shall conform to Fed. Spec. FF-N-105. Staples shall be Type III, zinc-coated, minimum length of 1-1/2 inch. Nails shall be Type II, zinc-coated, and of sufficient length for the purpose required.

2.1.9 Lock

Shall conform to Fed. Spec. FF-P-101, Type EPB with chain, 1-3/4 inch size, with 2 keys.

2.1.10 Concrete

All cast in place concrete shall have a minimum 28-day compressive strength of 3000 pounds per square inch. Compressive strength shall be determined with ASTM C 39.

2.2 ZINC COATING OF FERROUS METAL

All ferrous metal except barbed- and woven-wire, used in the construction of the fence and gates shall be hot-dip zinc-coated after fabrication with not less than 2.0 ounces of zinc per square foot of actual surface, as determined in accordance with tests set forth in ASTM A 90. Gate frames of welded construction shall be protected by zinc after welding by approved zinc-oxide primer or by zinc dust added to the molten weld. The SUBCONTRACTOR may apply corrosion protection methods that were used for the previous fencing materials if approved by CONTRACTOR.

PART 3 EXECUTION

3.1 REMOVAL OF EXISTING BARBED WIRE FENCE

Unless otherwise directed, existing barbed-wire fence, designated for removal, shall be completely removed in a safe, workmanlike manner. All material will be salvaged and reused in the new fence construction. Any excess materia, except for metal gates shall be disposed of off Government property by the SUBCONTRACTOR. Gate posts shall not be salvaged or re-used.

3.2 CONSTRUCTION

3.2.1 Wood Posts

Posthole excavation shall be carried down to indicated depths shown on the Drawings. Posts shall be held in line in a true vertical position by temporary bracing until backfilling with concrete is completed.

3.2.2 Steel Posts

Steel posts shall be held in a vertical position and driven to the indicated depths by a post driver and backfilled with concrete.

3.2.3 Corner, Brace, or End Panels

Corner, brace, or end panels as detailed shall be constructed at the beginning and terminal ends, at gate openings, at all intersections and at all corners or changes in horizontal alignment of fences, in existing fence on both sides of junction with new fence.

3.2.4 Pull Posts

Shall be constructed when the distance of unbraced fencing exceeds 640 feet. Pull posts shall be spaced equi-distant in the fence at intervals of 640 feet or less. The SUBCONTRACTOR shall be responsible for proper bracing of the fencing.

3.2.5 Wire Installation

Barbed wire shall be stretched taut and stapled to each wood post or fastened to steel posts by the method recommended by the manufacturer of the steel fence posts.

3.2.6 Alignment

Finished fencing shall be in proper alignment, with posts plumb and all wire work taut. Care shall be exercised to equalize the tension or pull on each side of the line posts.

3.2.7 Gate

The gate shall be installed with all hardware, locking devices, and other parts necessary for complete installation, all adjusted in proper working order.

3.2.8 Clearance and Longitudinal Grade (Not Used)

3.2.9 Berm Construction (Not Used)

3.2.10 Cleanup

All areas disturbed by installation of fence and gates shall be restored to the original condition or to the new design condition as, the case may be. The area shall be left in a clean and neat condition acceptable to the CONTRACTOR.

SECTION 02515

CONCRETE WORK

PART 1 GENERAL

1.1 APPLICABLE PUBLICATIONS

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

1.1.1 American Association of State Highway and Transportation Officials (AASHTO)

AASHTO-86 (1986) Guide for Design of Pavement Structures

1.1.2 American Concrete Institute (ACI)

ACI 211.1 (1991) Selecting Proportions for Normal, Heavyweight, and Mass Concrete

ACI 325.9R (1991) Construction of Concrete Pavements and Concrete Bases

ACT 318 (1989) Building Code Requirements for Reinforced Concrete

1.1.3 American Society for Testing and Materials (ASTM)

ASTM C 31 (1991) Making and Curing Concrete Test Specimens in the Field

ASTM C 33 (1992) Concrete Aggregates

ASTM C 39 (1986) Compressive Strength of Cylindrical Concrete Specimens

ASTM C 94 (1992) Ready-Mixed Concrete

ASTM C 109 (1992) Compressive Strength of Hydraulic Cement Mortars (Using 2-inch or 50-mm Cube Specimens)

ASTM C 143 (1990) Slump of Hydraulic Cement Concrete

ASTM C 150 (1992) Portland Cement

ASTM C 171 (1991) Sheet Materials for Curing Concrete

ASTM C 172 (1990) Sampling Freshly Mixed Concrete

ASTM C 173 (1978) Air Content of Freshly Mixed Concrete by the Volumetric Method

ASTM C 192 (1990) Making and Curing Concrete Test Specimens in the Laboratory

ASTM C 231 (1991) Air Content of Freshly Mixed Concrete by Pressure Method

ASTM C 260 (1986) Air-Entraining Admixtures for Concrete

ASTM C 309 (1991) Liquid Membrane-Forming Compounds for Curing Concrete

ASTM C 494 (1992) Chemical Admixtures for Concrete

ASTM C 618 (1992) Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete

ASTM C 1017 (1992) Chemical Admixture for Use in Producing Flowing Concrete

ASTM C 1751 (1991) Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)

ASTM C 1752 (1992) Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction

1.1.4 Corps of Engineers (COE)

CRD C 621 Nonshrink Grout

1.1.5 Federal Specifications (FS)

FS CCC-C-467 (1991) Cloth, Burlap, Jute (or Kenaf) REV O

1.1.6 National Ready-Mixed Concrete Association (NRMCA)

NRMCA-01-84	Certification of Ready-Mixed Concrete Production Facilities
NRMCA CPMB-100	Concrete Plant Standards REV 86
NRMCA TMMB-01	Truck Mixer and Agitator Standards REV 82

1.2 SUBMITTALS

The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

1.2.1 At least 14 days prior to commencing concrete placing operations, the SUBCONTRACTOR shall submit the results of trial mix along with a statement giving the maximum nominal coarse aggregate size and the proportions of all ingredients that will be used in the manufacture of each strength of concrete. Aggregate weights shall be based on the saturated surface dry condition. The statement shall be accompanied by test results from an independent commercial testing laboratory, attesting that the proportions selected will produce concrete of the qualities indicated. No substitutions shall be made in the materials used in the work without additional tests to show that the quality of the concrete is satisfactory.

1.2.2 Certified copies of laboratory test reports, including all test data, shall be submitted for aggregate, admixtures, reinforcement, and curing compound. These tests shall be made by an approved independent commercial laboratory or by a laboratory maintained by the manufacturers of the materials.

1.2.3 Cement, pozzolan, and ground iron blast-furnace slag will be accepted on the basis of manufacturer's certification of compliance, accompanied by mill test reports attesting that the materials meet the requirements of the specification under which it is furnished. No cement, pozzolan, or slag shall be used until notice of acceptance has been given by the CONTRACTOR.

1.3 GENERAL REQUIREMENTS

1.3.1 Design Scope

All concrete pavement construction or repairs shall conform to the provisions of AASHTO-86, ~~A~~ Guide for Design of Pavement Structures, ACI 325-9R, and ACI 318-83. ~~@~~

1.3.2 Strength Requirements

All cast-in-place concrete shall have a minimum 28-day compressive strength of 5000 pounds per square inch. Concrete made with high-early strength cement shall have a 7-day strength equal to the specified 28-day strength. Compressive strength shall be determined in accordance with ASTM C 39.

1.3.3 Air Entrainment

All concrete in the structure shall contain 5 to 7 percent total entrained air.

1.3.4 Special Properties

Concrete may contain other admixtures, such as water reducers, superplasticizers, or set retarding agents to provide special properties to the concrete, if approved.

1.3.5 Slump

Slump shall be within the following limits*:

<u>Structural Element</u>	<u>Slump in Inches</u>	
	<u>Minimum</u>	<u>Maximum</u>
Pavement and slabs	1	3
Any structural concrete approved for placement by pumping	None	6

* Where use of superplasticizers are approved to produce flowing concrete, these slump requirements do not apply.

1.4 PROPORTIONS OF MIX

1.4.1 Mixture Proportioning, Normal Weight Concrete

Trial batches shall contain materials proposed to be used in the project. Trial mixtures having proportions, consistencies and air content suitable for the work shall be made based on methodology described in ACI 211.1. Trial mixes shall be proportioned to produce concrete strengths specified.

1.5 STORAGE OF MATERIALS

Cement and pozzolan shall be stored in weathertight buildings, bins, or silos which will exclude moisture and contaminants. Aggregate stockpiles shall be arranged and used in a manner to avoid excessive segregation and to prevent contamination with other materials or with other sizes of aggregates. Reinforcing and accessories shall be stored above the ground on platforms, skids, or other supports. Other materials shall be stored in such a manner as to avoid contamination and deterioration. Admixtures which have been in storage at the project site for longer than 6 months or which have been subjected to freezing shall not be used unless retested and proven to meet the specified requirements.

PART 2 PRODUCTS

2.1 ADMIXTURES

Admixtures shall conform to the following.

2.1.1 Accelerating Admixture

ASTM C 494, Type C or E

2.1.2 Air-Entraining Admixture

ASTM C 260

2.1.3 Flowing Concrete Admixture

ASTM C 1017, Type 1 or 2

2.1.4 Water-Reducing or Retarding Admixture

ASTM C 494, Type A, B, D, F, or G

2.2 CEMENTITIOUS MATERIALS

2.2.1 Sulfate-resistant cement will be required. Portland cement will be ASTM C 150, Type V; or Type II having a tricalcium aluminate content of less than 5 percent, or meeting the optional physical requirement for sulfate expansion for Type V cement on Table 4, ASTM C 150; or Type II blended with a pozzolan meeting the requirements of ASTM C 618, Type F.

2.2.2 Sulfate-resistant concrete will have a water-cement ratio of less than 0.45. Calcium chloride or admixture containing the chloride ion will not be permitted in sulfate-resistant concrete. The curing time for sulfate-resistant concrete will be 12 days.

2.2.3 Due to the potential for alkali-aggregate reactivity, cement meeting the optional chemical requirements for low alkali cement on Table 2, ASTM C 150 shall also be specified for all concrete. The Resource Conservation Recovery Act (RCRA) mandates, where possible, all concrete specifications will also include the option to use pozzolan as a partial replacement for Portland cement.

2.3 AGGREGATES

Aggregates shall conform to the following.

2.3.1 Normal Weight Aggregate

ASTM C 33

Maximum nominal diameter of coarse aggregate shall be 1 inch.

2.4 CURING MATERIALS

2.4.1 Burlap

FS CCC-C-467

2.4.2 Impervious Sheets

ASTM C 171, type optional, except that polyethylene film, if used, shall be white opaque.

2.4.3 Membrane-Forming Compounds

ASTM C 309, Type 1-D, Class A or B

2.5 EMBEDDED ITEMS

Embedded items shall be of the size and type indicated or as needed for the application. Embedded steel items shall be galvanized steel unless otherwise specified.

2.6 NONSHRINK GROUT

Nonshrink grout shall conform to COE CRD-C 621 and shall be a formulation suitable for the application.

2.7 WATER

Water shall be potable, except that nonpotable water may be used if it produces mortar cubes having 7 and 28-day strengths at least 90 percent of the strength of similar specimens made with water from a municipal supply. The strength

comparison shall be made on mortars, identical except for mixing water, prepared and tested in accordance with ASTM C 109. Water for curing shall not contain any substance injurious to concrete, or which causes staining.

PART 3 EXECUTION

3.1 PREPARATION OF SURFACES

Surfaces to receive concrete shall be clean and free from frost, ice, mud, and water. Conduit and other similar items shall be in place and clean of any deleterious substance.

3.2 INSTALLATION OF EMBEDDED ITEMS

Embedded items shall be free from oil, loose scale or rust, and paint. Embedded items shall be installed at the locations indicated and required to serve the intended purpose. Voids in sleeves, slots and inserts shall be filled with readily removable material to prevent the entry of concrete.

3.3 BATCHING, MIXING AND TRANSPORTING CONCRETE

Ready-mixed concrete shall be batched, mixed and transported in accordance with ASTM C 94, except as otherwise specified. Truck mixers, agitators, and nonagitating units shall comply with NRMCA TMMB-01. Ready-mix plant equipment and facilities shall be certified in accordance with NRMCA-01. Site-mixed concrete shall be mixed in accordance with ACI 301. Onsite plant shall conform to the NRMCA CPMB-100.

3.3.1 Admixtures

Admixtures shall be batched within an accuracy of 3 percent. Where two or more admixtures are used in the same batch, they shall be batched separately and must be compatible. Retarding admixture shall be added within one minute after addition of water is complete or in the first quarter of the required mixing time, whichever is first. Superplasticizing admixtures shall be added as recommended by manufacturer. Concrete that shows evidence of total collapse or segregation caused by the use of admixture shall be removed from the site.

3.3.2 Control of Mixing Water

No water from the truck system or elsewhere shall be added after the initial introduction of mixing water for the batch except when on arrival at the jobsite, the slump of the concrete is less than that specified. Water added to bring the slump within the specified range shall not change the total water in the concrete to a point that the approved water-cement ration is exceeded. The drum shall be turned an additional 30 revolutions, or more, if necessary, until the added water is uniformly mixed into the concrete. Water shall not be added to the batch at any later time.

3.4 SAMPLING AND TESTING

Sampling and testing is the responsibility of the SUBCONTRACTOR and shall be performed by an approved testing agency.

3.4.1 Sampling of Concrete

Samples of concrete for air, slump, unit weight, and strength test shall be taken in accordance with ASTM C 172.

3.4.1.1 Air Content

Test for air content shall be performed in accordance with ASTM C 173 or ASTM C 231.

3.4.1.2 Slump

Tests shall be performed in accordance with ASTM C 143.

3.4.1.3 Compressive Strength

Tests shall be performed in accordance with ASTM C 39.

3.4.2 Evaluation and Acceptance of Concrete

3.4.2.1 Frequency of Testing

Samples for strength tests of each class of concrete placed each day. Field cured specimens for determining form removal time or when a structure may be put in service shall be made in numbers directed to check the adequacy of curing and protection of concrete in the structure. The specimens shall be removed from the molds at the age of 24 hours and shall be cured and protected, insofar as practicable, in the same manner as that given to the portion of the structure the samples represent.

3.4.2.2 Testing Procedures

Cylinders for acceptance tests shall be molded and cured in accordance with ASTM C 31. A strength test shall be the average of the strengths of two beams made from the same sample of concrete and tested at 28 days or at another specified test age.

3.4.2.3 Evaluation of Results

Concrete specified on the basis of compression strength will be considered satisfactory if the averages of all strength test results equal or exceed the specified strength and no individual strength test result falls below the required strength by more than 500 pounds per square inch.

3.5 CONVEYING CONCRETE

Concrete shall be conveyed from mixer to forms as rapidly as possible and within the time interval specified in paragraph **CONCRETE PLACEMENT** by methods which will prevent segregation or loss of ingredients.

3.5.1 Chutes

When concrete can be placed directly from a truck mixer or other transporting equipment, chutes attached to this equipment may be used. Separate chutes will not be permitted except when specifically approved.

3.5.2 Buckets

Bucket design shall be such that concrete of the required slump can be readily discharged. Bucket gates shall be essentially grout tight when closed. The bucket shall provide means for positive regulations of the amount and rate of deposit of concrete in each dumping position.

3.5.3 Belt Conveyors

Belt conveyors may be used when approved. Belt conveyors shall be designed for conveying concrete and shall be operated to assure a uniform flow of concrete to the final place of deposit without segregation or loss of mortar. Conveyors shall be provided with positive means for preventing segregation of the concrete at transfer points and point of placement.

3.5.4 Pumps

Concrete may be conveyed by positive displacement pumps when approved. Pump shall be the piston or squeeze pressure type. Pipeline shall be steel pipe or heavy duty flexible hose. Inside diameter of the pipe shall be at least three times the maximum size of the coarse aggregate. Distance to be pumped shall not exceed the limits recommended by the pump manufacturer. Concrete shall be supplied to the pump continuously. When pumping is completed, the concrete remaining in the pipeline shall be ejected without contaminating the concrete in place. After each use, the equipment shall be thoroughly cleaned. Flushing water shall be wasted outside the forms.

3.6 CONCRETE PLACEMENT

Mixed concrete which is transported in truck mixers or agitators or concrete which is truck mixed, shall be discharged within 1-1/2 hours or before the drum has revolved 300 revolutions, whichever comes first after the introduction of the mixing water to the cement and aggregates or the introduction of the cement to the aggregates. These limitations may be waived by the CONTRACTOR if the concrete is of such slump after the 1-1/2 hour time or 300 revolution limit has been reached that it can be placed, without the addition of water to the batch. When the concrete temperature exceeds 85 degrees F, the time shall be reduced to 45 minutes. Concrete shall be placed within 15 minutes after it has been discharged from the truck.

3.6.1 Placing Operation

Concrete shall be handled from mixer to forms in a continuous manner until the approved unit of operation is completed. Placing will not be permitted when the sun, heat, wind, or limitations of facilities furnished by the SUBCONTRACTOR prevent proper consolidation, finishing and curing. Concrete shall be deposited as close as possible to its final position in the forms, and there shall be no vertical drop greater than 8 feet except where suitable equipment is provided to prevent segregation and where specifically authorized. All slabs shall be placed in a single layer. Concrete to receive other construction shall be screened to the proper level to avoid excessive shimming or grouting.

3.6.2 Consolidation

Immediately after placing, each layer of concrete shall be consolidated by internal vibrators, except for slabs 4 inches or less. The vibrators shall at all times be adequate in effectiveness and number to properly consolidate the concrete; a spare vibrator shall be kept at the jobsite during all concrete placing operations. The vibrators shall have a frequency of not less than 8000 vibrations per minute, and the head diameter and amplitude shall be appropriate for the concrete mixture being placed. Vibrators shall be inserted vertically at uniform spacing over the area of placement. The distance between insertion shall be approximately 1-1/2 times the radius of action of the vibrator so that the area being vibrated will overlap the adjacent just-vibrated area by a few inches. The vibrator shall penetrate rapidly to the bottom of the layer. Vibrator shall be held stationary until the concrete is consolidated and then withdrawn slowly. Vibrators shall not be used to transport concrete within the forms. Slabs 4 inches and less in thickness shall be consolidated by properly designed vibrating screeds or other approved technique.

3.6.3 Cold Weather Requirements

Special protection measures, approved by the CONTRACTOR, shall be used if freezing temperatures are anticipated before the expiration of the specified curing period. The ambient temperature of the air where concrete shall be not less than 40 degrees F. The temperature of the concrete when placed shall be not less than 50 degrees F nor more than 75 degrees F. Heating of the mixing water or aggregates will be required to regulate the concrete placing temperature. Materials entering the mixer shall be free from ice, snow, or frozen lumps. Salt, chemicals or other materials shall not be incorporated in the concrete to prevent freezing. Upon written approval, a chemical admixture conforming to ASTM C 494 Type C or E may be used.

3.6.4 Warm Weather Requirements

The temperature of the concrete placed during warm weather shall not exceed 85 degrees F except where an approved retarder is used. The mixing water and/or aggregates shall be cooled, if necessary, to maintain a satisfactory placing temperature. In no case shall the placing temperature exceed 95 degrees F.

3.7 CONSTRUCTION JOINTS

Construction joints shall be located as indicated or approved. Where concrete work is interrupted by weather, end of work shift or other similar type of delay, location and type of construction joint shall be subject to approval of the CONTRACTOR. Construction joints in slabs on grade shall be keyed or doweled as shown. Where horizontal construction joints are required, a strip of 1-inch square-edge lumber, beveled and oiled to facilitate removal, shall be tacked to the inside of the forms at the construction joint. Concrete shall be placed to a point 1 inch above the underside of the strip. The strip shall be removed 1 hour after the concrete has been placed, and any irregularities in the joint line shall be leveled off with a wood float, and all laitance shall be removed.

3.8 FINISHING CONCRETE

3.8.1 Formed Surfaces

3.8.1.1 Repair of Surface Defects

Surface defects shall be repaired within 24 hours after the removal of forms. Honeycombed and other defective areas shall be cut back to solid concrete or to a depth of not less than 1 inch, whichever is greater. Edges shall be cut perpendicular to the surface of the concrete. The prepared areas shall be dampened and brush-coated with neat cement grout. The repair shall be made using mortar consisting of not more than 1 part cement to 2-1/2 parts sand. The mixed mortar shall be allowed to stand to stiffen (approximately 45 minutes), during which time the mortar shall be intermittently remixed without the addition of water. After the mortar has attained the stiffest consistency that will permit placing, the patching mix shall be thoroughly tamped into place by means approved by the CONTRACTOR and finished slightly higher than the surrounding surface. Holes left after the removal of form ties shall be cleaned and filled with patching mortar. Holes left by the removal of tie rods shall be reamed and filled by dry-packing. Repaired surfaces shall be cured as required for adjacent surfaces. The temperature of concrete, mortar patching material, and ambient air shall be above 50 degrees F while making repairs and during the curing period. Concrete with defects which affect the strength of the member or with excessive honeycombs will be rejected, or the defects shall be corrected as directed.

3.8.1.2 Rough-Slab Finish

Slabs to receive fill or mortar setting beds shall be screeded with straightedges immediately after consolidation to bring the surface to the required finish level with no coarse aggregate visible.

3.8.2 Unformed Surfaces

In cold weather, the air temperature in areas where concrete is being finished shall not be less than 50 degrees F. In hot windy weather, when the rate of evaporation of surface moisture, as determined by methodology presented in ACI 305R, may reasonably be expected to exceed 0.2 pounds per square foot per hour; coverings, windbreaks, or fog sprays shall be provided as necessary to prevent premature setting and drying of the surface. The dusting of surfaces with dry materials or the addition of water during finishing will not be permitted. Finished surfaces shall be plane, with no deviation greater than 3/16 inch when tested with a 10-foot straightedge. Surfaces shall be pitched to drains as appropriate.

3.9 CURING AND PROTECTION

3.9.1 General

All concrete shall be cured by an approved method for the period of time given below:

Concrete with Type I, II, IP or IS cement	7 days
Concrete with Type I or Type II cement blended with pozzolan	7 days

Immediately after placement, concrete shall be protected from premature drying extremes in temperature, rapid temperature change, mechanical injury and injury from rain and flowing water. Air and forms in contact with concrete shall be maintained at a temperature above 50 degrees F for the first 3 days and at a temperature above 32 degrees F for the remainder of the specified curing period. Exhaust fumes from combustion heating units shall be vented to the outside of the enclosure and heaters and ducts shall be placed and erected so as not to cause areas of overheating and drying of concrete surfaces or to create fire hazards. All materials and equipment needed for surfaces or to create fire hazards. All materials and equipment needed for adequate curing and protection shall be available and at the site prior to placing concrete. No fire or excessive heat shall be permitted near or in direct contact with the concrete at any time. Curing shall be accomplished by any of the following methods, or combination thereof, as approved.

3.9.2 Moist Curing

Concrete to be moist-cured shall be maintained continuously wet for the entire curing period. If water or curing materials used stains or discolors concrete surfaces which are to be permanently exposed, the concrete surfaces shall be cleaned. When wooden forms are left in place, during curing, they shall be kept wet at all times. If the forms are removed before the end of the curing period, curing shall be carried out as on unformed surfaces, using suitable materials. Horizontal surfaces shall be saturated sand, or by covering with waterproof paper, polyethylene sheet, polyethylene-coated burlap or saturated burlap.

3.9.3 Membrane Curing

Membrane curing shall not be used on surfaces that are to receive any subsequent treatment depending on adhesion or bonding to the concrete; except a styrene acrylate or chlorinated rubber compound meeting ASTM C 309, Class B requirements may be used for surfaces which are to receive waterproofing. The curing compound selected shall be compatible with any subsequent waterproofing. Membrane curing compound shall not be used on surfaces that are maintained at curing temperatures with free steam. Curing compound shall be applied to formed surfaces immediately after the forms are removed and prior to any patching or other surface treatment except the cleaning of loose sand, mortar, and debris from the surface. Surfaces shall be thoroughly moistened with water and the curing compound shall be applied to slab surfaces as soon as the bleeding water has disappeared. With the tops of joints being temporarily sealed to prevent entry of the compound and to prevent moisture loss during the curing period. Compound shall be applied in a one-coat continuous operation by mechanical spraying equipment, at a uniform coverage in accordance with the manufacturer's printed instructions. Concrete surfaces which have been subjected to rainfall within 3 hours after curing compound has been applied shall be resprayed by the method and at the coverage specified. On surfaces permanently exposed to view, the surface shall be shaded from direct rays of the sun for the duration of the curing period. Surfaces coated with curing compound shall be kept free of foot and vehicular traffic, and from other sources of abrasion and contamination during the curing period.

3.10 SEALING JOINTS

Joints shall be sealed immediately following curing of the concrete or as soon thereafter as weather conditions permit. Sawing of filler-type joints shall be accomplished immediately before sealing of the joints.

SECTION 02720

CONTAMINATED LIQUIDS REMOVAL

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

1.1.1 Sources

Contaminated liquid sources include personnel and vehicle decontamination activities, free liquids, and sanitary sewage wastewater from personnel facilities. Free liquids consist of liquids from spills, contaminated runoff, and liquids encountered during excavation.

1.1.2 Procedures

The SUBCONTRACTOR shall be responsible for the collection, removal, and disposal of contaminated liquids as described above. Refer to the Waste Management Plan, contained in Appendix C of the Draft - Landfills 2, 5, and 6 Cap Installation Project Work Plan, dated November 1995 (or latest revised version) for disposal procedures.

1.1.3 Characterization

The SUBCONTRACTOR is responsible for the sampling, analysis, and characterization of contaminated liquids as may be needed to meet regulatory requirements and the treatment/disposal facility requirements.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 DECONTAMINATION PAD

Water generated and collected from the decontamination pad shall be tested and properly disposed of as stated in the Waste Management Plan noted above.

3.2 FREE LIQUIDS

Leachate encountered and removed during excavation within the limits of the landfill, and runoff contaminated by fuels, oils, waste, and other harmful materials shall be collected, tested, and properly disposed of as stated in the Waste Management Plan noted above.

3.3 SANITARY SEWAGE WASTEWATER

All sanitary sewage wastewater shall be stored separately from all other contaminated liquids and shall be disposed of in accordance with the Waste Management Plan noted above.

SECTION 02930

SEEDING

PART 1 GENERAL

1.1 SUMMARY

The following specification is an adaptation from ~~A~~ General Downrange Seeding Specifications for Fort Carson, dated March 1995, which was provided by DECAM.

1.2 REFERENCES

The following publications listed below form a part of the specification to the extent referenced. The publications are referenced in the text by basic designation only.

U.S. DEPARTMENT OF AGRICULTURE: Federal Seed Act of 9 August 1939 (53 Stat. 1275)

DECAM: General Downrange Seeding Specifications for Fort Carson, March 1995

1.3 SUBMITTALS

SD-01 Data\

Manufacturer's Catalog Data\

Manufacturer's standard catalog data giving the brand names and catalog numbers of erosion control materials, in sufficient detail to demonstrate complete compliance with this section.

1. Erosion control blanket
2. Channel lining
3. Erosion control fence

Equipment\

List of proposed equipment to be used in performance of construction work including descriptive data.

SD-06 Instructions\

Manufacturers Instructions\

The manufacturers installation instructions and procedures.

SD-09 Reports\

Sampling and Testing\

Copies of field test results within 24 hours of completion of tests.

Approval of Materials\

Material sources and material test results prior to field use.

1.4 QUALITY CONTROL

The SUBCONTRACTOR shall establish and maintain quality control for operations under this section to assure compliance with contract requirements and maintain records of quality control for materials, equipment, and construction operations. The SUBCONTRACTOR shall notify DECAM through the CONTRACTOR at least 2 weeks prior to the start of seeding operations.

1.5 DELIVERY, STORAGE, AND HANDLING

1.5.1 Delivery

Material used for seeding, such as seed, fertilizer, hay, hay bales, blankets, etc., shall be inspected upon arrival at the job site. Unacceptable material shall be removed from the job site.

1.5.2 Storage

Seed shall be protected from any drying, moisture or contamination by detrimental material upon delivery and when being stored.

PART 2 PRODUCTS

2.1 SEED

Seed shall be state-certified seed of the latest season's crop and shall be delivered in original sealed packages bearing the producer's guaranteed analysis for percentages of mixture, purity, germination, weed-seed content, and inert material. All seed material shall be certified to be free of noxious weed seed. The date of testing shall be one year or less at time of planting. Seed shall be labeled in conformance with U.S. Department of Agriculture rules and regulations under the Federal Seed Act and applicable state seed laws. Seed that has become wet, moldy, or otherwise damaged will not be acceptable. All seed shall be adapted to southeast Colorado.

Onsite seed mixing shall be performed only in the presence of the CONTRACTOR. The pure live seed mixture to be used shall be as follows:

2.1.1 Seed Mixture

Seed Mixture: The mixture of each seed lot shall contain the following pounds of pure live seed per acre.

FORT CARSON - CRITICAL AREA SEED MIX	
Species	LB PLS/AC
¹ Barton Western Wheatgrass (<i>Agropyron smithii</i>)	6.0
¹ Vaughn sideoats grama (<i>Bouteloua curtipendula</i>)	3.0
Alkali sacaton (<i>Sporobolus airoides</i>)	0.2
Nordan Crested Wheatgrass (<i>Agropyron desertorum</i>)	1.0
Sand dropseed (<i>Sporobolus cryptandrus</i>)	0.1
Small burnet (<i>Sanguisorba minor</i>)	0.5
Ladak alfalfa (<i>Medicago sativa</i>)	0.5
TOTAL	11.30

¹ When Vaughn Side Oats Grama (*Bouteloua curtipendula*) is not available, Pastura Little Bluestem (*Schizachyrium scoparium*) or El Reno sideoats grama (*Bouteloua curtipendula*) at same LB PLS/AC shall be used as a substitute when approved by DECAM through the CONTRACTOR. Likewise, when Barton Western Wheatgrass is not available, Arriba Western Wheatgrass at the same seeding rate may be used when approved by DECAM through the CONTRACTOR. The seed varieties shall be mixed and sacked in the proper amount by the seed supplier according to the seed mix.

2.1.2 Critical Area Seeding Rate

Those areas which have been graded, received repeated foot traffic or have slopes 3:1 or greater. The seeding mix and rate stated in paragraph A shall be applied to all areas designated as a critical area.

2.1.3 Commercial Seed Formula

The following formula shall be used to determine the amount of commercial seed required to provide in each kind of seed the specified quantities of Pure Live Seed (PLS).

$$\frac{\text{Required Pounds Pure Live Seed} \times 100 \times 100}{\text{Purity}^2 \times \text{Germination}^2} = \text{Pounds Commercial Seed}$$

² Purity and Germination expressed as whole numbers.

2.2 NUTRIENT AMENDED SOIL/TOPSOIL

2.2.1 Definitions

The nutrient amended soil or topsoil layer is to be considered the upper four inches of the frost protection layer that has been amended as discussed below.

2.2.2 Soil Amendment

Soil to be used for the topsoil layer shall be free from hard lumps, plants and their roots, gravel, cinders, stone over 1 inch in any dimension, toxic substances, and any material or substance that may be harmful to plant growth.

2.2.3 Documentation

- a. Two sieve analysis for each source.
- b. Two organic matter content, ASTM D2974, Method C.
- c. Two tests each for the following: nutrient requirements, N, P, K, and applicable micro-nutrients for proposed seed mixture.

2.3 MULCH

2.3.1 Placement

The SUBCONTRACTOR shall use native grass hay at a rate of two tons (air dry weight) per acre, fixed in place with disk land packers or disk harrows on all surfaces with a 3:1 slope or less. Slopes steeper than a 3:1 slope shall require an erosion control blanket as described in Section 2.41. All other mulch materials and/or methods of application shall be approved by DECAM through the CONTRACTOR, prior to application.

2.3.2 Type

Mulch shall be long stem native grass hay that is free from noxious weeds, mold or other objectionable material. When long stem native grass hay is not available, a substitute may be used when approved by DECAM through the CONTRACTOR. If approved, acceptable substitutes are straw from oats, wheat, rye, barley or rice from which grain has been removed, and that are free of noxious weeds, mold, or other objectionable material. The mulch shall contain at least 50 percent by weight of material which is 10 inches or longer. Mulch shall be in air-dry condition and suitable for placing with blower equipment.

2.4 SOIL EROSION CONTROL MATERIAL AND STAPLES

2.4.1 Erosion Control Blanket

Soil Erosion Control Blanket shall consist of a machine produced mat of biodegradable material. It shall be certified by the supplier or manufacturer to be of sufficient quality and design to function as intended on slopes greater than 3:1 with moderate to heavy runoff conditions. The erosion control blanket shall be a uniform thickness, with all material evenly distributed over the blanket. The blanket shall be covered on one side with either plastic netting or twisted kraft paper cord netting. Plastic netting shall be biodegradable polypropylene extruded plastic net with 1 to 2 percent carbon black and shall have a **2**-inch to 3/4-inch mesh opening. Twisted kraft paper cord netting shall have a mesh size not to exceed 1-1/2 inches by 3 inches. The blanket shall be composed of either biodegradable straw, coconut, or wood fiber of any approved mixture. A substitute may be used when approved by DECAM through the CONTRACTOR. No blanket with paper as the major component shall be used unless prior approval is obtained from DECAM through the CONTRACTOR. The blanket shall be laid in a 1 foot trench, stapled every **2** yard, and covered with soil on the entire length of its upper slope. The erosion control blanket shall then be securely stapled to the site using staples as described in 2.42. All manufacturer's specifications shall be supplied to DECAM and CONTRACTOR for approval prior to application.

2.4.2 Staples

Staples shall be made of 11 gauge or heavier steel wire, **A** shaped with a 1-inch crown, and legs a minimum of 8 inches in length. These staples shall be placed according to the slope gradient and length, as specified by the manufacturer.

2.4.3 Channel Lining (Erosion Matting for Channels)

The fabric utilized shall meet the manufacturer's recommendations for the proposed use. The staple pattern utilized shall be as recommended by the manufacturer. The CONTRACTOR shall be provided the manufacturer's specifications (including installation methods) prior to application, and based upon his/her review, the material may or may not be accepted. Enkamat 7010 or equivalent (based on shear stress resistance) shall be used. The erosion matting is for long-term erosion protection and biodegradable materials shall not be used.

2.4.4 Erosion Control Fence

Silt fencing shall be made of a strong rot-proof synthetic fiber. The fibers shall be resistant to deterioration due to ultraviolet light and heat exposure. The synthetic fibers shall be woven into a fabric. No additional fencing or wire backing is required. The fencing material shall have a strong tie cord in the top of the material. Low porosity silt fence shall be the same as or equal to Propex-Silt Stop, Mirafi 700x, or Beltech 755 or equal as approved by CONTRACTOR.

2.4.5 Straw or Hay Bales

Bales for erosion check shall be either straw or hay bales tied firmly with wire or plastic tie and shall be 14' to 16' high x 18' to 36' in size. Wood stakes to secure the bales shall be a minimum of 2' to 36' in size.

PART 3 EXECUTION

3.1 DATES FOR SEEDING

Seedbed preparation and seeding shall be accomplished between the dates of 1 May to 31 October, depending upon soil moisture conditions, except as otherwise directed in writing by DECAM through the CONTRACTOR. Seeding operations shall not be performed when the soil is wet, sticks to tires and equipment, or is frozen.

3.2 PREPARATION OF SEEDBED

3.2.1 General

All vegetation, weeds, brush, and rubbish shall be cleared and removed from areas to be seeded. Ground surface shall conform to the grades indicated and any deviations therefrom shall be corrected prior to seeding. Soil used for repair of erosion and correction of grade deficiencies, shall conform to that specified in 2.2.

3.2.2 Tillage

Tillage should be performed only if the area was previously graded, otherwise the site should be seeded only (tillage may be required as specified by the CONTRACTOR). The soil shall be tilled to a depth of at least 4 inches and no more than 6 inches by plowing, discing, harrowing, by the use of rototillage machinery or other approved operations to prepare an acceptable seedbed. The work shall be performed only during periods when, in the opinion of the CONTRACTOR, beneficial results are likely to be obtained. When drought, excessive moisture, or other unsatisfactory conditions prevail, the work shall be stopped when directed by the CONTRACTOR. The soil surface shall be leveled to meet finished grade requirements before the next specified operations. All seedbed preparation shall be performed on the contour to reduce soil loss. On slopes greater than 3 horizontal to 1 vertical, tillage shall be done by scarifying the soil surface with heavy rakes, rotating chains drawn by tractor from the top of the slope, by a boom arrangement from the bottom of the slope, or by other equipment approved by the CONTRACTOR. On these slopes, minimum tillage depth shall be 2 inches. No tillage is required on slopes steeper than 1 horizontal to 1 vertical.

3.3 PLANTING SEED

3.3.1 General

Any previously prepared seedbed areas compacted or damaged by interim rains, traffic, or other cause, shall be reworked to restore the ground condition previously specified prior to seeding. Seed shall be planted (drilled) as specified in paragraph 2.1.

3.3.2 Methods

The specified seed varieties and indicated amounts of the mixture shall be uniformly drilled over all ground areas disturbed in a manner that will produce an even stand of grass over the entire areas seeded. On areas with slopes 3:1 or flatter, (unless limited by size of area) seed shall be drilled using a rangeland seed drill, unless otherwise approved by DECAM through the CONTRACTOR.

3.3.2.1 Drill Seeding

The seed shall be drilled using a rangeland drill. The rangeland drill will be pulled at a speed not to exceed 4 mph. The seed shall be drilled and covered to a depth not less than 1/4 inch or more than 3/4 inch. The drill rows shall be spaced no more than 10 inches apart. The seed drill shall be calibrated to achieve seeding rates outlined in paragraph 2.01.

3.3.3 Vegetative Mulching

Vegetative Mulching shall be done within the same day as seeding.

3.3.3.1 Applying Mulch

Mulch shall be spread uniformly in a continuous blanket over the seeded areas, using two tons (4,000 lbs) of material per acre. The mulch shall be spread in such a manner as to prevent bunching.

3.3.3.2 Securing Mulch

Immediately following the spreading of the mulch, the material shall be anchored securely into the soil a minimum of 3 inches by means of a mulch anchoring machine equipped with large coulter-type discs spaced on approximate 8-inch centers. Edges of the discs shall be dull to prevent cutting of the mulch material. In areas where equipment cannot be used, mulch shall be secured by a shallow covering of earth or by embedding with approved hand methods, including a straight blade spade with a dulled edge.

3.3.4 Watering

No water will be applied to native, field, (dry land) seedings unless required for erosion control blanket installation.

3.4 SOIL EROSION CONTROL MATERIAL

Erosion control material shall be installed on all slopes steeper than 3:1. Crimped mulch shall be used on all slopes that are 3:1 to 2.5:1. Slopes steeper than 2.5:1 shall be covered with erosion control blankets. Mulching and blanketing may be used on flatter slopes when deemed necessary such as at landfills or highly erodible slopes. Mulch will not be used with soil erosion control blankets.

3.4.1 Soil Preparation

The surface of ditches and slopes to receive soil erosion control blankets shall be finished to a smooth and even condition with all debris, roots, stones, and lumps raked out and removed.

3.4.2 Placement of Soil Erosion Control Material

3.4.2.1 General

Soil erosion control blanket shall be unrolled and placed with the netting on top. Apply wire staples vertically through the netting and blanket into the ground, keeping netting taut against anchor staples. Erosion control blanket placement shall be accomplished without damage to the installed material or distortion of established grades.

3.4.2.2 Ditches

Erosion control blanket shall be laid with all overlaps in the direction of water flow, or with the manufacturer's specifications. The manufacturer's specifications shall be provided to the CONTRACTOR prior to installation.

3.4.2.3 Slopes

Erosion control blanket may be laid horizontally or vertically on the slope and secured as manufacturer's specifications require. The manufacturer's specifications will be provided to the CONTRACTOR prior to installation.

3.4.3 Maintenance

The erosion control blanket shall be maintained until all work on the entire contract or designated portion thereof has been completed and accepted. Maintenance shall consist of the repair of eroded areas and the repair or replacement and restapling of loose or undermined erosion control blanket, including reseeding.

3.4.4 Soil Erosion Control Fence

Erosion fence shall be installed to reduce sediment loss. A 6-inch deep trench shall be dug just outside the posts for the full length of the silt fence. Set the studded **A** posts a maximum of 6 feet on center. Incline the posts toward the runoff source at an angle of not more than 20 degrees from vertical. Drive the posts into the ground so that no more than 3 feet protrudes about the ground. Attach the fabric to the posts, and place the fabric into the trench and backfill and compact the soil. All splice joints shall overlap a minimum of 18 inches.

3.4.5 Straw or Hay Bales

Straw or hay bales shall be installed in those areas required to control sheet or gully erosion.

3.5 PROTECTION AND CLEANUP

After seeding and mulching operations have been completed, barricades and approved warning signs shall be erected as required to provide protection against traffic and trespass. Excess material from seeding and mulching operations, and all debris, shall be cleaned up and disposed of off the site at an approved location.

3.6 ESTABLISHMENT AND MAINTENANCE

3.6.1 General

The SUBCONTRACTOR shall be responsible for the accomplishment of the specifications in Division 2. Proper maintenance shall include protection of embankments and ditches from erosion, and maintenance of the mulch covering up to the completion of the final inspection.

3.6.2 Protection of Seeded Areas

Immediately after seeding, the area shall be protected against traffic or other use by erecting barricades, as required, and placing approved signs at appropriate intervals until final acceptance.

3.6.3 Reseeding and Repair

During the maintenance period, any eroded or otherwise damaged areas shall be promptly repaired to reestablish the end condition specified herein. Repair shall include all the operations indicated for the particular area involved to produce the end result specified prior to damage.

3.7 FINAL ACCEPTANCE

Final inspection and acceptance will take place when the CONTRACTOR has completed all procedures outlined in the contract. Acceptance will be based upon compliance with seedbed preparation, seeding and mulching as defined in paragraph 3.6.